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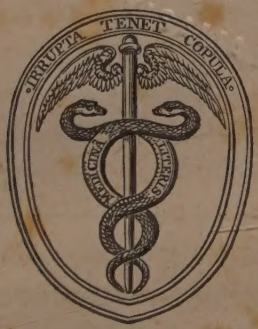
PRACTICAL SURGERY;

WITH

One Hundred and Fifty Engravings on Wood.

BY

ROBERT LISTON, SURGEON.



SECOND AMERICAN,

FROM THE THIRD LONDON EDITION.

WITH ADDITIONAL NOTES AND ILLUSTRATIONS.

BY GEORGE W. NORRIS,

ONE OF THE SURGEONS TO THE PENNSYLVANIA HOSPITAL.

PHILADELPHIA:

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PREFACE OF THE AMERICAN EDITOR.

The work of Mr. Liston, now presented to the profession, may be regarded as a summary of the practice of the first of British operative surgeons of the present day. The character of the book is strictly practical, and being concisely written, and well illustrated by cuts, is peculiarly adapted for the use of students. To the numerous practitioners spread over our great extent of country, who are deprived of access to other more voluminous works, it is believed that it will also prove useful as a book of occasional reference. In presenting it to the public, the Editor has restricted himself to adding a few brief notices of the manner in which some of the more common surgical affections are treated with us, at the same time that he has called attention to certain points which have been passed over lightly by the author, and embodied with it the details of several American operations, which from their originality or rarity have appeared to him worthy of notice.

September 1, 1838.

The very favorable reception of the first American edition of the Practical Surgery, has called for the issue of a second reprint from the third London edition. It will be found much enlarged, and in every way more worthy of the attention of the student and practitioner.

443 Chesnut Street, Philadelphia.
January 13, 1842.

PREFACE.

THE following work on "Practical Surgery" was planned in the spring of the present year, and executed during the summer months, in those hours which the author could snatch from his professional engagements in public and private.

The aim throughout has been to produce a work which should be useful to the students of surgery and young practitioners,—exhibiting a plain common-sense view of the most important injuries and diseases which are met with in practice, unencumbered by speculations or theories, and accompanied by simple directions how to conduct the treatment. The good intentions of the author must be placed against the imperfect execution of the task.

If the arrangement of the work, as may be expected from the above announcement, be defective in some respects, the same cannot be said of the illustrations, which have all been planned, drawn, and engraved in the same short period. These are the joint production of the Messrs. Bagg. It is hoped that the beauty of the designs, and the correctness of their execution, may put the reader in good humour, and in some degree avert his displeasure, if he think there be reason to indulge therein.

The author cannot find terms strong enough to express the sense he entertains of the services he has received from Mr. Bagg, jun.; as also from Mr. W. J. Erasmus Wilson, whose

assistance was most handsomely and readily afforded throughout the entire work, in making dissections, and inventing plans, for displaying the different subjects to advantage.

The author, moreover, is bound to express his obligations to his excellent friend and late assistant, Mr. James Miller, now practising in Edinburgh, (whose valuable aid he had in preparing the "Elements of Surgery" for the press,) for the chapter on "Restoration of Lost Parts." He was too happy to accept of Mr. Miller's kind offer to extend for him some short and very meagre notes on the subject, as but a very limited period was allowed for completing the work.

Oct. 19, 1837.

A Third Edition having been called for, the letter-press has been revised and corrected with care. Various alterations and very extensive additions have been made, and a great many new wood-cuts added; some have also been engraved anew, in place of such as did not exhibit the subjects distinctly. These improvements, it is hoped, may render the work more useful to surgical pupils, and better entitled to the patronage of the profession at large.

In preparing this Edition for press, the author has been indebted to his late house-surgeon, Mr. Ancram, for many interesting cases, which might otherwise have escaped his recollection, and moreover for many useful remarks.

London, 5, *Clifford Street*,
Oct. 1, 1840.

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INTRODUCTION.

It has been well and truly remarked by the celebrated Desault, "that the simplicity of an operation is the measure of its perfection;" and the same test may, with great propriety, be applied to other curative means, internal as well as external. Simplicity ought to be studied in all our dressings,—in our applications to recent solutions of continuity, as well as to the various breaches of surface of long continuance. This opinion has been gradually gaining ground. The hot dressings, filthy unguents, greasy poultices, stimulating plasters, and complicated bandages, must give place, very soon, where as yet they have not done so, to the elegant substitute for a poultice, to the unirritating isinglass plaster, and to careful position of the injured part. No less is it advisable, to avoid all complication in the apparatus for adjusting and retaining solutions of continuity in the different parts composing the skeleton, and in those for remedying congenital or accidental deformities. Our "armamentaria" should contain simple and efficient instruments only; the springs, grooves, notches, and sliding blades, in many instruments, seeming to be chiefly intended to compensate for want of tact and manual dexterity—to enable those, who have not made the art of surgery a study, to bungle through those operations that chance or official situation may throw in their way. The apparatus, though simple, ought to be in good order: "et prompta semper habeat instrumenta; nam in iis, penuria detri-

mentosa est et artem inopem facit," says Riolanus. In cases of disease or accident, by the careful employment of mechanical means, combined with judicious constitutional and local treatment, recourse to the last remedy—operative procedure—can very often be happily dispensed with; many fractures, for instance, which, under bad management, would very likely be followed by mortification, or extensive suppuration, by death of bone, or articular disease, may,—by being kept steady, rendered independent of the motions of other parts, and placed so as to favour the return of blood, the risk of inflammatory engorgement being thus prevented,—be brought to a favorable termination, without suffering or hazard to the patient's life. A more intimate acquaintance with pathological changes, and therapeutic agents and means, has abridged very much the field of operative surgery. Such operations as are still, of necessity, resorted to, are, from more enlightened views of the actions of the animal economy and the resources of nature, stripped of much of their severity, and rendered much less hazardous and formidable than heretofore. Amputation for instance, is not now performed, in one out of twenty cases in which it was had recourse to for diseased joints, hardly a century ago; and it can, besides, be safely effected in a twentieth part of the time which is often, even at the present day, occupied over it. The operations for fistula, stone, aneurism, &c., &c., are now, in the hands of the practised and well qualified surgeon, completed safely, quickly and in comparison, pleasantly. In the nature of things, however, many operations can never be dispensed with. Displacements and injuries must be reduced, adjusted, and repaired; morbid growths still resist discutients, and must be taken away before the parts in their neighbourhood are vitiated, or before the enlargement interferes seriously and prejudicially with the functions of a part. Foreign bodies cannot always be prevented from effecting a lodgment in canals and cavities, and must necessarily be removed. The morbid contractions of such organs, and accumulations in them, can only be got rid of by recourse to operation. If many of these operative procedures are not conducted with great caution, skill, dexterity, and tempered boldness, the patient may be brought into a very hazardous predicament. It behoves, there-

fore—indeed it is the bounden duty of every one engaging in the practice of our profession, in addition to a correct knowledge of the *science of surgery*,—the causes, symptoms, and consequences of disease, the signs of injuries, the morbid changes of the tissues involved,—to make moreover, the *art of operating* the subject of most careful and diligent study. Not that it is by any means advisable or necessary that every practitioner should seek for the performance of the more difficult or capital operations, as they are sometimes denominated; these are with propriety chiefly entrusted to those whose opportunities are more ample and constant. To put out of view the safety of the patient, a person not in the habit of operating can scarcely be remunerated for the anxiety and risk which he incurs in a difficult and serious case. There are many operations and manipulations, however, which all should be prepared and ready to undertake without hesitation or delay—many of the minor, and some few of the more dangerous and troublesome.

The art of operating has, even by many of those in prominent situations, been too lightly considered, and too little practised on the dead body. The foundation of the study of the art of operating must be laid in the dissecting-room, and it is only when we have acquired dexterity on the dead subject, that we can be justified in interfering with the living. Many poor creatures have been sacrificed in consequence of the ignorance, carelessness, and self-sufficiency even of scientific professors, who have either despised or neglected the study of surgical anatomy, the consideration of the casualties which arise during the various operations, and the due education of their fingers. The infliction of unnecessary pain, through want of adroitness in the use of instruments, and consequent protraction of the operative procedure—the hazarding in the slightest degree the safety of any one who puts confidence in us, and entrusts to us his life, or of one who, as in public practice, is, by chance, and without the means of appeal, thrown upon our care—cannot by any means be palliated or defended—and is, in point of fact, highly criminal.

Accuracy of diagnosis, confidence in our own resources, promptitude in applying means in an emergency, are attained

by study at the bedside of those suffering under disease or injury. It is only by experience, by collecting and arranging facts which may serve as precedents, that expertness in manipulation is to be acquired; and this is within the reach of any one who will take pains, and who will gladly seize every opportunity of instruction and improvement. Were the recommendations given above better followed, we should have presented to us fewer of those scenes so shocking to humanity, which have been well described by one of the most interesting writers on surgery: the operators are represented as agitated, miserable, trembling, hesitating in the midst of difficulties, feeling in the wound for things the position of which they had not understood, turning round to their friends for that support which should come from within, holding consultation amidst the cries of the patient, or even retiring to consult about his case whilst he was bleeding, in great pain, and awful expectation. With the view of facilitating, and rendering more interesting, the study of practical surgery; and with the hope of reducing in frequency the occurrences above reprobated,—so degrading, so detrimental to our profession,—the present work has, in a great measure, been undertaken.

PRACTICAL SURGERY.

CHAPTER I.

ON THE DIVISION OF PARTS BY THE KNIFE, &c.

The absolute necessity for the performance of a surgical operation having been clearly indicated,—(the injury or disease, under which the patient labours, being of such a nature as to render the part in which it is situated unserviceable, or of such severity as evidently to be wearing out his constitution by violent and continued suffering, or destroying his health and threatening his existence by excessive and wasting discharges,)—the first consideration that ought to occupy attention, is the state of mind and feelings of the sufferer, and the condition of the digestive organs and circulating system. These being all in a favourable state,—the patient having full confidence in the resources of our art, and of those who are to exercise it upon him,—being anxious moreover to have his life prolonged,—determined, in fact, if possible, to make a good recovery,—his different secretions being in a healthy state—his stomach, bowels, and kidneys being all in good order, and his circulation quiet,—the less delay in resorting to operative procedure, and the shorter the period of uncertainty and suspense in which the patient is kept, the better. In the preparations, for the more serious and difficult operations more especially, it will be the surgeon's duty to procure proper assistants, and to make sure that they all understand what is expected of them. The operator must consider well the place which he himself should

occupy during the proceeding, so that he may, without awkwardness or change of position, be able to effect his object efficiently and gracefully; he will also act wisely in general, so to dispose the instruments and apparatus, that he can at once put his own hand upon them, and thus render himself independent of lookers-on, who, in nine cases out of ten, owing to anxiety or curiosity, hurry and agitation, hand anything but what may at the instant be required. If he have had experience in such proceedings, he will previously have ascertained that every thing is in order, that the cutting instruments have good points, that their edges are keen, and that the joints of forceps and scissors move freely and readily.

All incisions, more especially through the skin, the most sensible part of the animal machine, should be effected with rapidity, and in such a way as to give as little pain and shock to the nervous system as possible. With this view, the parts must be put completely on the stretch, and the knife applied so as to affect the solution of continuity without pressure or bruising. The fingers of the right or left hand, otherwise unemployed, are to be so disposed as to stretch the parts about to be incised: the thumb is placed on one side, and the pulps of the fore or other fingers, according to circumstances, are spread out on the other. In effecting more extensive separation of parts, the fingers of an assistant are opposed to those of the principal operator. These dispositions being properly made, the division should at once be effected to the desired extent. A surgeon who can use either hand equally well, or nearly so, in holding and managing his instruments, possesses very great advantages. It is almost immaterial to him, in many of the smaller operations, in what position his patient is placed in regard to him. A great deal of awkwardness and unnecessary exposure is thus often saved. In many operations, as venesection, the opening of abscesses in different situations, the division of fistula in ano, the extraction of or reclination of a cataract, &c. &c., this must often be noticed and felt. By a little practice, the facility of moving steadily the fingers of either hand is attainable, and surgical pupils are much to blame who do not take every opportunity of becoming ambidextrous.

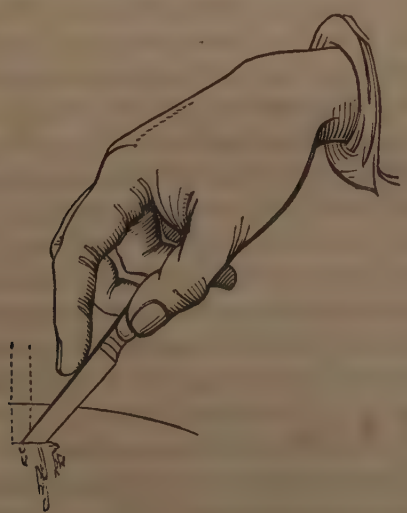
The cutaneous tissues, and in many instances the subjacent parts, should be divided by a single incision, rather than that the patient should be tormented, and the feelings of those who witness the proceeding hurt, by the process being effected bit by bit, as it were, by slow and tedious procedure. Incisions may be made either from without inwards, (from the periphery to the centre,) or from within outwards. In either case, the principle upon which the instrument is made to cut, must be well considered. Every knife is to be looked upon as a fine saw, the teeth of some are, or ought to be, set forwards, as, for instance, the cornea knife, and the bistouries for some amputations; these cut best from point to heel, as does a razor. The greater number, however, are properly set otherwise, and act efficiently only in being drawn from heel to point. It can be readily understood, that the pain experienced in the division of parts must be in proportion to the pressure and the rapidity of execution, in the application of the instrument. The art of cutting clean, of dividing the parts with celerity and neatness, can be acquired only by much practice. The stiff style of manipulation generally pursued in the dissecting-room, must give place to a more free, light, though still decided mode of handling the knife. The free motion of the wrist-joint must be superadded to the practised and more steady actions of the fingers. And if agility and address are to be acquired by constant study and practice in the elegant exercise of the small sword, why should not "grace and splendour," as was the boast of Hildanus, be equally attainable by the surgeon, and by similar means? In cutting from without inwards, the skin, together with the subcutaneous cellular tissue, should be at once and freely divided. The pain of partially dividing the cutaneous tissue, tails being left at either end of the cut, is very intense; and such incisions are, besides, not so available as they would otherwise be, for the intended purpose of evacuating fluid, permitting the extraction of foreign bodies, or for the dissection of morbid growths. The incisions should at once divide the skin completely and to such an extent as will fully allow all the future steps of an operation to be accomplished. A free incision through the skin is but in a slight degree more painful than one

of a more limited extent; the patient is afterwards saved much pain by free room being given for all further proceeding, and then there is no necessity for pulling and stretching the tissues. The pausing of an operator also, in the midst of a dissection, with the resort to fresh and more extensive incisions of the coverings, is always an awkward and cruel-looking step, and attended with much additional and unnecessary pain to the patient.

The form and size of the instrument ought always to be in proportion to the extent of the proposed incisions, as regards both their length and depth: nothing can possibly be imagined more abominable or cruel, for instance, than the attempt (which has to my knowledge been repeatedly made, and which I have in fact witnessed) to remove the lower extremity of a full-grown person with a common scalpel or dissecting knife. If an extensive incision is necessary, an instrument presenting sufficient length of edge must be employed, so that the parts may be separated smoothly and quickly. The point of cutting-instruments should either be in a line with the back, which ought then to be perfectly straight; or, again, both back and edge should be so far convex, the point being in the middle of the blade. An experienced surgeon will choose an instrument well balanced, and in a steady handle; and he will hold it differently, according to the object he has in view. Should he be required to cut on important parts, to perform a delicate dissection of the living tissues, he will choose a short-bladed instrument with a handle rather long and well rounded: after the superficial incisions are effected, he will hold it as he would a writing-pen, lightly but firmly, so that he may turn the edge, and cut either towards or from himself, as occasion may require. A small well-made scalpel, with a good point, and less convexity than those usually employed, is the instrument best adapted for such a purpose. The handle should be perfectly smooth and polished,—as, in fact, ought to be the handles of all instruments; in the use of which, delicacy of touch is necessary. Some practitioners have carried fashion so far, that many even of the catheters and sounds, to be found in the instrument-makers' collections, are fitted with wooden handles deeply grooved and

chequered. The inventors of these seem to have been more afraid of losing hold of the instrument, in a fit of agitation and panic, than intent upon fitting it for its legitimate purpose, and using it in a proper and workman-like manner.

Again, for cutting upon infiltrated tissues, for opening collections of matter, for the dissection of loose tumors, or for exposing dead bone, a broad-bladed bistoury, large or small, as may be necessary, is preferable; for the smaller disarticulations, for evacuating some abscesses,—as those at the inner canthus of the eye,—a narrow bistoury will be found more suitable. According to the steadiness of the operator's hand, and the resistance he expects in separating the tissues, the instrument may either be held near the further end of the handle betwixt the points of the middle finger and thumb, opposed to each other,—or be grasped at the joint in the same manner, the blade being steadied by the fore-finger advanced along its back, whilst the end of the handle rests on the ball of the little finger. The position of the fingers must be changed a little, as the direction of the point or edge of the bistoury is varied. In dividing the skin, the knife, whether a scalpel or bistoury, is to be held and entered, with the point and blade at right angles to the surface. It is carried with a decisive movement down to the subcuta-



neous cellular tissue; the blade is then inclined, and made to approximate the surface to be divided; and by a rapid and slightly sawing motion, with as little pressure as possible, the object is effected to the desired extent, much more being done by art than by force. The incision is finished by again bringing the knife into a perpendicular position as regards the surface, so as to divide the entire thickness of the covering at the point of withdrawal.

The skin may, in some instances, be divided readily by having it raised in a fold from the subjacent parts, betwixt the fingers and thumb of the operator and assistant; the heel of the blade of the bistoury is then applied to the interposed part at the apex of the fold, and by pressure and slight sawing motion, carried down to its base.

MODE OF OPENING PURULENT COLLECTIONS.

It is by such an instrument, used as above directed, that cavities containing purulent or other fluids are to be opened. The broad-bladed, sharp-pointed bistoury in a folding-handle, fixed, when open, by a spring catch, is in all respects a more workman-like tool than the abscess lancets which are generally employed. When an inflammatory swelling has attained considerable size; when it is plain, from its duration, from the pitting of the œdematous surface, and from the boggy sensation communicated to the finger, that pus has formed; when, from the depth of the fluid and the unyielding nature of the superimposed parts, superficial or deep fasciæ, the patient suffers great pain; and when there is no apparent prospect of a speedy thinning of the coverings, pointing, and spontaneous evacuation of the fluid,—no delay ought to take place in giving relief, by a free opening. This proceeding may be justified and rendered imperative at a very early period, in consequence of the situation of the abscess over bones or joints, or in the neighbourhood of canals or cavities, the functions of which might be thus interfered with, or their structure destroyed. The knife is to be entered steadily, and with its blade in a perpendicular direction to the surface; it is pushed onwards until resistance ceases, and the point is found to move more freely. By withdrawing the

instrument a little, the oozing of purulent fluid will confirm the supposition, entertained by the feeling conveyed to the hand, that the cavity is perforated. The superimposed parts are then divided, by a rapid sawing motion, to the requisite extent. In some cases, the knife must be entered very deeply, in order to reach the matter; and, even in regions containing important organs, this may be done with perfect safety, when the position of the parts is duly regarded. The vessels and nerves are often displaced and removed from the surface by the morbid accumulations, and the knife is passed right down upon their course, and to such a depth as would endanger them very materially in the normal state, without coming within a considerable distance of them; this may frequently be observed in cases of abscess of the neck and behind the angle of the jaw, when energetic and proper treatment is adopted. Delay in such cases is inadmissible, in every point of view, from the extreme pain, the immediate symptoms caused by interference with the respiratory and alimentary tubes, and the probable consequences. The opening ought at once to be made clean and patent, so as to give a free exit to the contained fluid, and that without any thumbing or squeezing of the exquisitely tender and painful parts around. Much pain and fever are thus saved, and the necessity for extension of the aperture, or for making counter-openings, is done away with. It may so happen, that, in spite of the best management, as regards the situation of an opening for the evacuation of pus, that the fluid does not escape freely, that it falls down below the level of the aperture; or a case in which the opening has at first been badly placed may present itself; in such circumstances the enlargement of the original incision may suffice for the complete emptying of the cyst, or it may be more prudent and judicious practice to make a new opening. In some of these cases, the thinning or discoloration of the integument will mark the proper place, and the point of a bistoury can at once be plunged into it; in others, again, an examination by a probe,—directed by the escape of matter, upon pressure around,—may be advisable; and upon the end of this, or of a grooved probe substituted for the first and exploratory one, an incision may be made. Occasionally, to preserve the free drain of fluid,

for a time, in the proper direction, a silk thread may be drawn from the one opening to the other; or a little slip of lint, smeared with oil or ointment, or moistened in tepid water, may be inserted with the flat end of the eye-probe.

It ought to be recollected, that an opening of an inch in length, quickly and smoothly made, is attended with no more pain than a coarse and hazardous plunge of an abscess lancet, which, though the inflamed surface may be partially lacerated to some considerable extent, will be found, perhaps, to have barely penetrated the cavity by an aparture of not more than two lines,—its object, after all, being inefficiently fulfilled. The opening must uniformly be made at that part of the abscess which is most likely to be generally dependent; the state of the patient, and his probable position for some time after this little operation, must, with that view, be carefully considered beforehand.

In some few cases, more than one opening had better be made, even in the first instance. Abscesses, extending over a considerable surface, cannot readily be got to discharge freely through one opening; and it is vain to hope for suspension of discharge and contraction of the cavity, so long as matter is permitted to lodge. For instance, it is generally necessary to treat in this fashion, the abscess which is met with over the ligament of the patella, caused by bruise, and often resulting from inflammation of the bursa in that situation; if one opening is made in the middle and front of the limb, the fluid falls down and separates the skin from the fascia, on the tibial and fibular sides; counter-openings, after a day or two, will be found necessary, and perhaps, after a time, will require to be repeated. All these are rendered unnecessary, the cure is abridged, and altogether the patient is saved much pain, by the properly directed and scientific course of proceeding already indicated, viz. the making of an opening at once on each side of the limb at the most dependent part of the collection. In badly treated cases of the kind, sinuses have been cut up, sometimes across the course of the fibre and limb, and bandages and compresses have been applied, for months, in vain. Small and superficial chronic abscesses, far advanced, are more speedily brought into a healthy and well-disposed state when they are opened by a bit of potass—as will

be directed by-and-bye—than when evacuated by the knife; by introducing a small bit of potass, a slough will be formed, and a free and permanent exit established for the purulent fluid.

Occasionally persons are met with who have a peculiar hemorrhagic tendency, bleeding profusely from the slighest scratch; in such cases it would be far preferable to open purulent collections by the potassa fusæ. A case of this kind is recorded in the "*Elements of Surgery*," in which several abscesses were so opened; one on the hip was very deep, and the potass must have been made to penetrate through an inch and a half at least of integument, fatty matter, &c.

Abscesses which have fallen into the substance of a limb, or which have been formed in the intermuscular cellular tissue, ought, on no account, to be permitted, through hesitation or delay, to acquire a great size. These abscesses are slow of coming to the surface, and they are not attended with pain, or much inconvenience: the secreting surface becomes gradually more extensive; but the secretion is slow, or the absorption, in some measure, keeps pace with it for a time. When, however, the cavity is exposed, and air is admitted, inflammatory action of the lining membrane is apt to ensue. The discharge becomes much vitiated, then bloody and putrid; tremendous constitutional disturbance and irritative fever of a most alarming character ensue, and are greatly aggravated if the fluid have not a free exit. These abscesses are sometimes met with of an enormous bulk, and of very long standing.

A gentleman consulted me in the summer of 1834, on account of a supposed solid tumor on the inner aspect of the thigh, and the nature of the swelling was explained to him. It was a cold abscess of many months' standing, and contained perhaps six ounces of matter. In the end of 1836 I was again called to see the same tumor. It had then surrounded the limb, and contained many pints of fluid: the parietes had begun to thin at two points, and a speedy opening of the cavity was inevitable. The patient, about the middle period of life, still enjoyed tolerably good health. On his return to the country, an incision was made into it. All went well for six or seven days; then matter became confined; a violent attack of fever immediately ensued;

and this was followed by epidemic catarrhal fever, then prevalent. Sunk to the lowest degree of exhaustion and debility, he again came to town with a most fearful discharge, cough, and all the symptoms of hectic fever, and after a very short time died exhausted. Had this abscess been opened two years earlier, and freely, in all probability everything would have gone on well.

The practice recommended by the high authority of the late Mr. Abernethy, and at one time much in vogue, has now, so far as I know, been in a great measure abandoned. It consisted in making a small indirect opening into the cyst, which was, after a partial evacuation of the contents, again closed. A few cases did well, the opening being repeated at intervals; but the greater number of patients were put in great jeopardy by the local excitement, accompanied, as it almost uniformly was, by violent fever. In opening chronic abscess, the dependent point is to be chosen; the opening should be free and direct,—made by inserting the bistoury as already explained, and enlarging the puncture in proper form: matter must by no means be permitted to lodge,—and this is provided against by counter-opening, if need be. The common and thoughtless practice of squeezing together the sides of suppurating cavities, whether chronic or acute, ought to be by all means discouraged. The patient, it is true, seems to be relieved at the time from a greater load of matter, but in reality much pain and positive injury are thus inflicted. The surfaces so treated are apt, from the mechanical injury, to inflame; the vacuum occasioned is filled by air or by rapid secretion of bloody serous fluid, if not by copious escape of blood from the vessels deprived of their accustomed support, and torn from their connexions. The after discharge is profuse and most offensive, and accompanied by a dangerous excitement of the system, an intense irritative fever, and delirium. Those who have had the opportunity of seeing, under the microscope, the injected lining membrane of the cyst of an abscess, will be little inclined to squeeze together the sides of purulent cavities into which they have made openings. The infinite number of vessels that ramify on the surface, and the layer of lymph by which these are covered, are the means by which the filling up

and obliteration of the cavity is effected by nature; by bruising and destroying these, very much pain will be caused to the patient, and the cure will not, in all likelihood, be so rapid.

PUNCTURES AND SETONS.

Puncture by a trocar is sometimes had recourse to for the evacuation of matter from chronic abscess; and it is the mode generally pursued in evacuating fluid from serous cavities. This mode is also resorted to when it is desirable that the discharge should have vent as it is secreted; and when the collection of fluid is covered by different layers, loosely connected. Instances in point will be given in the course of this work, and the proper mode of proceeding directed and delineated.

Punctures with the point of a small lancet or needle are made through the integument, in order to empty the cellular tissue of serosity, when from its presence the superimposed parts are much distended, and the deeper tissues compressed. The instrument is held betwixt the fore-finger and thumb lightly, and the middle finger is passed along the blade to prevent its perforating more deeply than necessary, should the patient be unsteady. These small incisions should be made as strictly in the direction of the fibres as larger ones, in order that deformity and other unpleasant consequences may be avoided. Punctures are also made with needles, grooved or not, to ascertain the contents of swellings. This practice will be adverted to in another place. Punctures with needles are sometimes made deeply into muscular parts to relieve painful affections, and with astonishing effect. The instrument, held by its head betwixt the thumb and fore-finger, is inserted with a slight rotatory motion, the course of larger vessels or nerves being avoided. The skin is often punctured at two points, and the intervening and subjacent cellular tissue divided, so as to contain a foreign substance,—a skein of cotton or silk, or a piece of India-rubber tape,—with the view of exciting and keeping up discharge, and thus causing a derivation from more deep disease. This operation of inserting a seton is performed either with a broad needle, which is thrust through

a pinched-up fold of integument; or may be effected by the common broad bistoury and eye-probe, the probe being slid along the blade of the knife, partially withdrawn.

The preliminary incisions in many operations, both of the smaller and greater kind, can be made more quickly and with much less pressure,—the parts being completely on the stretch,—by reversing the proceeding and cutting from within outwards. An instrument,—varying in shape according to circumstances, and the uses it is afterwards to serve,—is pushed across under the skin, which, if loosely attached to the subjacent parts, is raised from them as already directed, p. 6. After the point has emerged, (the puncture being made and the transfixion completed,) the edge is turned towards the surface, and quickly brought through the superimposed parts. Some abscesses can be thus conveniently and cleverly opened, and for this purpose a narrow, straight, or curved, sharp-pointed bistoury is used. In many cases of hernia, and of tumor, the coverings can be thus divided, by a small scalpel, or broad-bladed bistoury: and in the greater number of amputations much pain and after annoyance is saved by following this method, cutting from the centre towards the periphery of the limb.

THE DIRECTION, EXTENT, &c., OF INCISIONS.

The form and extent of incisions on the surface of the body must necessarily be suited to the objects the operator has in view. The simple incision,—which, for good reasons to be given in the succeeding chapters, ought, without exception, to be made longitudinally, as regards the limbs and neck, and on the trunk ought to follow pretty uniformly the course of the subjacent muscles,—may, unless carried to an immoderate extent, be insufficient for the exposure and removal of morbid growths, or of decayed and dead parts of the animal economy,—for the extraction of foreign bodies, or for the exposure of any part of the osseous system, which it may be thought advisable and expedient to divide or remove. Exceptions must occasionally be made to this rule, as for instance in the subcutaneous abscess of the neck, in which case the position and direction

the opening, with the view of preventing deformity as much as possible.

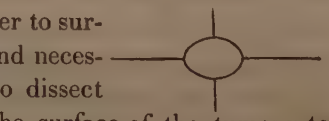
A portion of integument must, in many cases, necessarily be turned aside, for the purposes above indicated, and for many others. An incision, forming some part of a large or small circle may be made by a dexterous turn of the knife, and by carefully stretching the parts during the process. The course of the incision may be curvilinear, and may terminate or finish in a straight incision, thus: Such irregularly shaped incisions are often contrived so as to embrace in their course sinuses or papillæ, which discharge the accumulations from suppurating cavities, or lead to dead parts. Again, by such deviations from a straight line, a portion of integument may be readily dissected back, in order to expose the subjacent parts, and enable the surgeon to effect more perfectly the object of his operation.

But, in a great variety of cases, a more extensive exposure of the subcutaneous tissues, normal or abnormal, is requisite; and for this purpose the skin must be divided, so that a flap or flaps, as they are called, can be turned aside. Two cuts may be made to diverge, or form of incision. The meet at a point, being the or most convenient mode of effecting this object is, the skin being well and carefully stretched, to make a slanting incision of sufficient length, and at the one or other end of it to commence another, which shall diverge at a more or less acute angle, according to the circumstances of the case. It will generally be advisable to arrange so that the apex of the angle be dependent. A square flap may be formed by making two parallel incisions fall upon the ends of a transverse or longitudinal one so,—

Again, two flaps may be turned aside, after incisions such as these:

Many of these incisions are made by cutting from within outwards, and they should be so planned that the parts shall be well put upon the stretch, and that the second or incident cut shall not go beyond the one which it is made to meet. Two flaps may sometimes be made advantageously by such arrangement of the longitudinal and cross incisions, as these. It becomes occasionally necessary to turn aside the skin very completely and to a considerable extent; and with this view four flaps are formed by the crucial incisions,

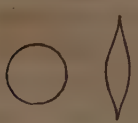
In some cases complicated forms of incision are required, for which no rules or plans can be laid down or given. For instance, in exposing vascular growths, so as to surround them by ligature, it may be necessary to remove part of the integument, and still further to denude them by the turning back of flaps. I had occasion to do so the other day, in a case of subcutaneous erectile tumour on the shoulder of a child. Part of the integument was discoloured and adherent to the subjacent mass, an original nævus maternus; but the boundaries of the tumour extended far beyond. In order to surround the diseased parts, it was found necessary to make incisions thus,—and to dissect the intervening integument from the surface of the tumour to the requisite extent.



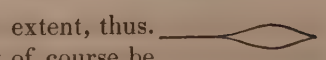
Regard must be had, in the planning of all these incisions, to the nature of the injury or disease, the situation of wounds or openings, to the size of the injured or diseased parts, to the extent of our contemplated proceedings, and the direction of the subjacent fibres, as will be afterwards shown.

Circumstances now and then demand the removal of part of the skin: but this proceeding ought, when possible, by every means to be avoided and shunned. The cutaneous tissue is capable of immense extension, as is seen during many natural processes, and in the growth and increase of external and internal tumours; and we know that after accouchemens, and after

the evacuation of serous collections in the abdominal cavity, the extended parts soon regain their normal condition, and tightly embrace the partially emptied cavities. The coverings of external tumours of enormous size bear great distension; but to render this less rapid and inconvenient, the integument is borrowed, as it were, from the neighbouring parts. For instance, the skin of the penis, of the perineum, abdomen, and groins, contributes to cover and support any large scrotal tumour. If in such cases integument is removed to any extent, with the false notion that there will otherwise be an exuberance of this structure, it will be discovered, when too late, that the cure, instead of being retarded by redundance of skin and lodgment of matter, will more probably be delayed by deficiency of covering and slow healing of the exposed surface. The extensibility of the skin is well seen, after the loss of the scrotum by sloughing, by the rapid covering which is afforded to the exposed organs from the surrounding cutaneous tissues, borrowed from the neighbouring parts, the perineum, groins, and hypogastrium. In all cases, when the skin is not thinned to a great degree, and altered in structure, it will be prudent to leave nature to deal with it, when laid down in position, after removal of the offending part. In such cases, however, great care must be observed as regards the approximation and retention of the edges, and the formation of a dependent opening, so as to prevent accumulation of blood, serum, or pus, at various periods of the cure. Cases frequently occur where the skin and cellular tissue, in consequence of morbid action either inherent in, or propagated to them, are intimately adherent to the subjacent parts, and must of necessity be extirpated to some extent. To embrace such portions of the external coverings of diseased parts, incisions must be made of a circular or elliptical form.



The latter, if possible, is to be preferred, in many situations; after much loss of integument, still the divided edges may be brought into close or nearly immediate contact, so that the period of cure shall be but little protracted. Such forms of incisions as above represented, especially the latter, may occasionally be conjoined

with the simple division to a certain extent, thus.  The various plans above given must of course be varied and modified, according to the nature of the case and the judgment of the practitioner; for here, as in all other matters, there is no rule that does not admit of an exception.

In making incisions upon important parts, a young surgeon may act wisely in separating, one by one, the layers of condensed cellular tissue and fascia from each other, raising them upon a grooved probe or director, and then dividing them by drawing the edge of his knife in the groove, or pushing its back along it. This proceeding is advised and too much resorted to in the operation for hernia, and even more so in that for aneurism; much delay and pain is thus unnecessarily occasioned without any additional security, and, besides, very dangerous consequences may follow. The highly injurious effect of lacerating the cellular tissue around a large vessel, and separating it extensively from its connexions and vascular supply, will be hereafter insisted upon. With a little practice, incisions may be made upon the most delicate parts, and without risk, by the hand unsupported, one layer being cut after the other. If any instrument is wanted to make the proceeding more safe,—if layers closely investing a hernial tumour, for instance, which has been well handled, are to be cautiously raised from it, or if the sac contains little if any fluid, embracing the contents very closely, and perhaps adherent to some extent—then well made dissecting forceps may be useful, and the more so if the operator has not had experience in the matter, and cannot readily and cleverly use the nails and joints of his fingers.

In opening suppurating fistulous tracks in the cellular tissue, and in making counter openings, a strong and long probe, or director, may occasionally be wanted: a pretty full-sized grooved probe with an eye at one end, and with the groove open at the other, is the most suitable and useful instrument. It is passed along the sinus; a narrow, blunt-pointed, straight, or crooked knife is slid along it, and the handle is raised from the guide, if the object is to divide the whole extent; or, a sharp-pointed bistoury having been pushed along the track to its extremity, the point is made, by depressing the handle, to

penetrate the coverings from within, and, with a sliding and drawing motion, the superimposed parts are laid asunder. In many cases, by a judicious manipulation, the probe-pointed knife, or even the sharp-pointed one, with or without a small bit of bees' wax on its point, may be employed without any guide. The division of living tissues cannot be made by scissors, to any extent with advantage; the proceeding is a painful one, and the surfaces must necessarily be more contused than when cut by the proper application of a well-set knife. Union, accordingly, cannot confidently be reckoned upon, after operations so conducted. It may be advisable, however, to substitute scissors, or concealed or sliding knives, for the more simple instruments, in performing some few operations on children, or on nervous or unsteady patients, more especially in situations difficult to reach. The rules to be observed in making incisions in the deeper-seated parts, so as to avoid important parts, to save blood, and to enable the operator to get safely and quickly through his undertaking, without exhausting the nervous power of his patient, will be treated of fully in describing some of the capital operations, and those for the removal of tumours.

Having given so much consideration to the division of parts, it may now be proper to say something of the circumstances that arise out of such proceedings. Hæmorrhage is always the most alarming occurrence, and the most dangerous, if allowed to proceed to any extent, and is that which demands the most prompt attention.

By position of parts, in many instances, bleeding will be put a stop to at once, more especially if it proceed chiefly from venous branches. This is often seen after an extensive division of parts, for the purpose of relieving tension, evacuating the contents of vessels, or discharging fluids which have been effused into the cellular tissue, in cases of violent inflammation of the surface. It is always desirable to see that there is no obstacle to the return of venous blood, after many of the greater operations, as amputation; the ligature of many open mouths, which otherwise would be and are generally secured, may be thus avoided. Bleeding from veins may always be arrested by removing the obstacles to the return of blood, and by slight

pressure, if need be. Great danger is supposed to accrue from the application of ligatures to veins, and the practice is generally avoided; an open state of their divided extremities, after suppuration is established, is equally if not more to be dreaded.

The cut extremities of arterial branches, if small, may be prevented from pouring out their contents to a prejudicial extent by the application of cold around the part, by astringents from the mineral and vegetable kingdoms, and by slight pressure. Vessels of a larger class had better have their extremities closed at once, by the proper application of a ligature; and this should be effected with as little disturbance of neighbouring tissues as possible. If the cellular substance is loose and fine, no difficulty will be experienced in pulling out the open end of the vessel by the use of the common dissecting forceps, or of the sharp hook,—the tenaculum, as it is commonly called. When no assistant is at hand, the surgeon will find the advantage of possessing a pair of forceps, with well-fitted points, and which are held closely in contact by a catch or slide. These are now to be had of Messrs. Savigny and Co., St. James-street, Messrs. Weiss, Strand, and other instrument-makers, of a much less clumsy form than heretofore.

In seizing the open mouth of a vessel with forceps, the point of the instrument may be introduced into the canal, or both sides may be seized at the same time: the mode of proceeding must depend upon the state of the surrounding cellular membrane and sheath. Some vessels, in parts admitting of much motion, as the facial and others, are so long and loosely attached that their cut extremities project, and can be seized even by the nails, or by the finger and thumb; or, sometimes a ligature may be thrown around without any evulsion whatever. The ligature is occasionally hung over the forceps or tenaculum, with a noose upon it: it is more advisable that the assistant should take hold of the ligature, (one of small, firm, round, hempen thread, well waxed, about twelve or sixteen inches long, is to be preferred,) quite free, and make first one hitch and then a second upon the bleeding point. He can thus take care to turn the ends so that a "good, honest, devilish tight, and hard" knot, one which cannot by any possibility become relaxed and

slip off, shall be made. It is not necessary for any surgical purpose that there should be any "quibbling provision made by the implication and return of the two ends of the strings through the annulus, or noose, made by the second implication of them, to get them slipped and undone by." No chance ought to be thrown away in tying ligatures; they must be so secured that there shall be no excuse for their slipping. It would answer no purpose to dilate here upon the impropriety of including veins or nerves in the noose of the ligature, along with the arteries of any considerable size. It is often impossible to avoid taking in the sheath of small branches; the accompanying veins and portions of muscular substance, and now and then nervous twigs, are necessarily included, and the more so when parts are divided which have been involved in inflammatory action. Great difficulty in securing bleeding vessels occasionally results in such cases; as neither retraction nor contraction of the vessels takes place in consequence of the surrounding cellular tissue being infiltrated or condensed. From the same cause, it is not an easy matter to separate and pull out the open mouth, so as to seize it; and it becomes occasionally necessary to carry a ligature round the bleeding point by means of a curved, sharp needle. It is imposible, by words, to explain the preferable mode of deligation; the knot should be what, by seafaring men, is known as the reef-knot, and is shown in the sketch, page 34. What is called the surgeon's knot, that in which the ends are passed twice through the first noose, is or ought to be, out of use and forgotten. It is not applicable to the ligature of vessels, if the clean division of the inner coats and the intimate apposition of the surfaces is desired. A puckering must be occasioned by it, prejudicial to the cure, and the second noose does not apply well over the first. This knot may sometimes be employed in tying deep-seated tumours, where it is not possible to apply the finger, or an instrument, to prevent the simple one from slipping. In that case, the end of the ligature must also be twice passed through the second noose.

After the application of a ligature to a vessel of the first class, —the carotid, subclavian or iliacs,—it is, in my opinion, advisa-

ble to leave both ends hanging from the wound. Though the knot is properly made and firmly drawn, the surgeon may have misgivings as to the risk of the ligature becoming slack, and of the knot becoming undone by the constant and forcible impulse of the blood. It may be desirable to diminish the size of the foreign body in the incision, in order that the excitement and discharge may be as slight as possible; with this view it may be considered proper to remove one end of the thread, or perhaps to take away both. In either case, it will be a judicious and safe procedure to apply a third knot, taking care that this shall be made after the fashion of the others, the two ends coming out evenly and opposite each other, without any awkward twist. The advantage gained by taking away one of the ends, in a case when but one ligature is employed, must be but very slight. If a foreign body is to be left hanging out throughout the whole depth of the wound, it matters little whether it be composed of one or two threads.

The practice of cutting off both ends of ligatures was at one time very much in fashion. It was thought that the mere noose or knot might by possibility remain imbedded in the living tissues, surrounded by a cellular cyst, and occasion no annoyance; and again it was fondly imagined and hoped, that by employing ligatures of animal substances,—tendon, cat-gut, or fish-skin,—the noose, after answering its purpose of closing the vessel for a sufficient time, might be removed by the absorbents, and thus occasion neither irritation nor annoyance. It has never yet been explained, however, by the advocates for this practice, why the absorption of the ligature should take place exactly at the favourable period after the vessel is closed by organised fibrin and not before. Nor has it been shown that it does so at any period whatever the substance employed may have been. All these hopes have been disappointed; ligatures, of whatever substance, do now and then remain hid for a long time, but very generally they occasion trouble; after the cure has been thought complete, they give rise to irritation, pain, inflammatory swelling, and formation of matter; abscess after abscess ensues, one knot comes out after another, and ultimately all the offending foreign bodies are expelled; and the perfect recovery is thus very long pro-

tracted. In all wounds likely to heal at an early period, one end of each ligature on the smaller vessels had best be cut off close to the knot, and left only of such a length as to project a little from the surface of the integuments, and very great care should be taken that no ligature is lost sight of and left in the wound. They should all be brought out at one or other end of the incision, and, if possible, the whole, or the greater number, at the most dependent extremity. In wounds which it is not advisable or possible to bring together, and which must necessarily be long of closing, both ends of all the ligatures may be cut off close to the surface of the wound.

It is well known that a vessel which has been torn across furnishes little if any blood; and this, as will be afterwards explained, arises from the elongation of the cellular coat, and the corrugation and retraction of the internal one. The process has been imitated from time immemorial by surgeons, in suppressing the flow from some vessels; but of late years an attempt was made to persuade the profession to adopt the practice in almost all cases, and in all situations, to the exclusion of the ligature. The plan succeeds very well in vessels of the second class, such as those of the fore-arm; but it is not very safe in those of larger size, and to the smaller twigs, which cannot be pulled out and separated from the nerves and other tissues around, it is altogether inapplicable. If ligatures are applied to any, it is as well to treat all alike; and the practice as recommended above, will be found the safest, and in all points of view quite unobjectionable.

The arrest of bleeding may occasionally be effected by judiciously applied pressure. This object may be attained temporarily by compression of the vessel or vessels betwixt the heart and wound. If continued long, this must be attended with dangerous consequences; the lower part of a limb becomes engorged from the obstruction of the returning blood, and gangrene speedily follows. This must inevitably be the result, when compression is made upon the whole circumference of a limb. Ring tourniquets have been contrived and employed to obviate this danger and difficulty; they are not very useful or applicable. In fact, partial pressure, even by the most clever and ingenious-

ly contrived apparatus, cannot be endured for any long continuance. Pressure on the bleeding point is alone to be trusted to, as an effectual means of staying the effusion of blood. The cavity and surface are in the first place to be cleared of coagulum and all foreign matter. The smallest portion of coagulated blood will interfere with the accurate adaptation of the compresses, and will encourage the effusion, as much as would a bit of sponge steeped in hot water. The mode of effecting the compression will be spoken of in Chapter VI.

In the modern and more approved practice of surgery, cauteries are seldom, if ever, had recourse to for arresting hæmorrhage. The proceeding is appalling, cruel, and after all not much to be trusted to. Caustics are also, in a great measure, dispensed with. For many purposes they are to be preferred to, and are equally efficient as, the hot iron, or other fiery application—as for the insertion of issues, the destruction of unsound cellular tissue, the removal of skin which covers or surrounds chronic abscesses or weak ulcers, the changing the character of the edges of sores of an intractable nature, or the annihilation of the cysts of tumours.

The division of parts is occasionally to be effected with propriety and safety only by the employment of ligatures. Sinous tracks at one time were so laid open, and many good surgeons, as Desault, pursued this plan in fistula in ano. I have, in some few cases, followed the practice with advantage in abscess of a chronic kind, by the side of the bowel, and in cases when the patient was alarmed at, and adverse to, the employment of cutting instruments. In a case which presented lately, of very complete congenital phymosis in a gentleman of highly hæmorrhagic diathesis, (the males of his family had all shown the same disposition—some, in fact, had died in consequence of uncontrollable bleeding,) I considered it a more prudent plan to pass a ligature through the prepuce by the side of the frænum, and by tightening it to cut through the covering, than under such circumstances to resort to the use of the bistoury. Some tumours can be attacked with safety by means of ligature alone; tumours in the canals, opening upon the surface, may be so placed, that, though not endued with excessive vascularity, bleeding from a

cut surface made for their removal can be stayed with great difficulty. The blood drains away for a time without notice, and accumulates in clots, so as to encourage a dangerous or even fatal effusion of the vital fluid: also tumours presenting on the external surface are often furnished so freely by vessels of a large size,—are, as it were, made up so much of interlacements of vascular tissue, and the circulation in the immediate neighbourhood, besides, is so exceedingly energetic, that incision cannot be attempted without the greatest risk. In fact, from ill-advised and ill-conducted proceedings of the kind, lives have often been sacrificed, and patients have even bled to death on the table before the eyes of the operator. Some vascular growths must be included together with their coverings; such may be thin and adherent, or involved in the action, and pervaded also by abnormal erectile tissue. Other morbid masses may be more securely tied, and more quickly strangulated, with much less suffering to the patient, and much less consequent deformity, by first uncovering the growth, and detaching it from the surrounding parts. Flaps having been made of sufficient size and proper form, the ligatures can be inserted and tied, as represented in the sketches illustrative of the subject in Chapter IX.

CHAPTER II.

ON THE UNION AND AFTER TREATMENT OF WOUNDS.

It must at once appear of the utmost consequence to every one who reflects upon the subject, that solutions of continuity should be so managed, as that, with few exceptions, they may be repaired in as short a period as possible. The greater number of wounds, produced accidentally, are so circumstanced that they can be united only by the second intention. They may indeed bleed freely, and their edges may look clean and smooth, but they are almost always attended by more or less bruising, a great deal of force having been generally applied in inflicting them. But however smooth and neat the incision may appear, the direction in which it has been made will, in all probability, more or less preclude the chance of immediate and speedy union. If a surgeon has the choice, as he very frequently has, as regards the form and extent of division of the soft parts, he is very much to blame indeed if he does not manage his proceedings, so that the edges shall come together without any pulling, stretching, or undue pressure on the surrounding tissues. The period, situation, and other circumstances, most favorable to immediate union of a wound, ought to be well considered and understood by every medical practitioner. So long as oozing of blood continues, no purpose can in general be answered by pulling the divided surfaces into close contact. If this practice be pursued—if the parts be tightly drawn together, plastered, bandaged, and huddled up,—the blood which oozes away from the smaller vessels is necessarily prevented from escaping. The consequence must be infiltration of the

thin and loose open cellular tissue around, distension of the cavity of the wound, and separation of the surfaces, certainly of the deep-seated parts, and very probably throughout the whole extent of the wound. There must consequently ensue a congested state of the surrounding vessels, perhaps a troublesome hæmorrhage from branches that would otherwise have become sealed up; at all events a great deal of constitutional disturbance, a heated, swollen state of the injured part, a profuse bloody and putrid discharge must occur, followed by wasting suppuration from a foul cavity which will be long in taking on a healthy action.

A sort of routine practice has been long pursued in dressing wounds. They are put together without delay, and their edges having been squeezed into apposition are retained so by various means, such as sutures, plasters, compresses, and bandages. They are carefully covered up and concealed from view for a certain number of days. Then the envelopes of cotton and flannel, the compress cloths, the pledgets of healing ointment, and plasters are taken away, loaded with putrid exhalations and a profusion of bloody, ill-digested, fœtid matter. A basin is forthwith held under the injured part, and the exposed and tender surface is deluged with water from a sponge, and then well squeezed and wiped. Then comes a re-application of retentive bandage, of the plaster, of the grease mixed with drying powder, all surmounted by some absorbent stuff, as charpie or tow, to soak up the discharge. This is not unaccompanied by pain, often more complained of than that attendant upon the original injury or operation. The process is repeated day after day; the patient is kept in a state of constant excitement, and often, worn out by suffering, discharge, and hectic fever, falls a victim to the practice. It would here serve no purpose to detail the mode of cutting the plasters, and of spreading the pledgets; nor would there be any use in giving an opinion as to whether a mixture of the earth called armenian bole, or the impure oxyde of zinc, the tutty or calamine, was the best ingredient to put into the digestive, drying, healing unguents, or as to what kind of animal fat and vegetable oil was preferable for their composition; nor would any good come of stating how the soiled

bandages and filthy straps are to be removed. The system is a bad one, the applications filthy and abominable; the whole proceeding outrages nature and common sense. The wound is, as it were, put into a forcing-bed; excited action, beyond what is required, is hurried on, and the consequence is, that union seldom, if ever, can or does take place. On the contrary, a suppurating surface, with profuse discharge, is formed; and a very tedious cure, if any, is obtained.

Surfaces are not disposed to unite for many hours after the division and separation have occurred. So long as oozing continues, there is no good end to be achieved by their close apposition. It is only when reaction has occurred, when vascular excitement around the solution of continuity has taken place, when the whole circulation has been roused, and when plastic matter begins to be secreted and thrown out, that the process can be expected to commence. The edges of a large wound, as that resulting from amputation of the extremities, may be approximated in part so soon as bleeding from the principal vessels and larger branches has been arrested. But the close apposition, and the application of all the retentive means, had better be delayed for six or eight hours at least. In the interval, extreme sensibility of the injured parts may be abated, the oozing moderated, and the chance of secondary hæmorrhage much diminished, by covering the parts with lint dipped in cold water, and frequently renewed; or, a piece of lint may be placed on the wound, and a constant irrigation of the exposed surface kept for some time by threads passing from a vessel containing cold water. This plan is very useful when the whole surface of a wound is exposed. In cases where there is a deep cavity in which coagulated blood may collect, as at the bottom of the wound after amputation of the thigh, where the flaps, as they always should be, are very long, it is much better to change the lint frequently. This practice is the best that can be resorted to also in accidental incised wounds that are fresh, and bleed freely. In these, however, after hæmorrhage has entirely ceased, applications of an agreeable warmth should be substituted, such as poultice of bread and water, or, what is much to be preferred for its simplicity, lint of thick texture,

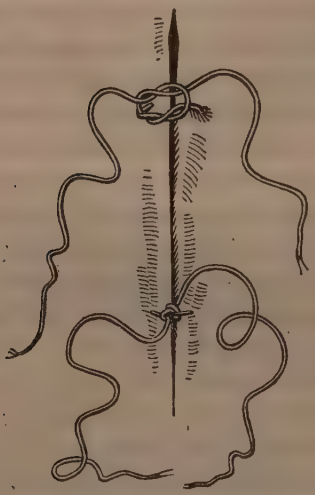
and of sufficient size to cover the wound, soaked in tepid water, and that overlaid with an ample piece of oiled silk, to prevent evaporation. Heat and moisture, by which qualities a poultice produces its soothing and beneficial effects,—by which the surface is relaxed, its capillary circulation encouraged, and discharge promoted,—are thus amply afforded, without any of the weight, putrefactive fermentation, stench, and filth, which is inseparable even from the best and most scientifically contrived epithems and cataplasms. Of course the approximation of such wounds is effected, as much as possible, by position; and by the same means the return of blood is favoured, and engorgement of the vessels and inflammatory swelling prevented in a very great degree. The lower limb, if implicated, should be well raised above the level of the body, when in the recumbent position, on pillows, or on an inclined plane properly stuffed; and the upper extremity is also to be kept similarly elevated. If the patient is in the erect position, the latter is placed favorably and supported by a sling. If the wound run across the fibres of the skin and muscles underneath, these are to be relaxed by flexion, or extension, as may be, of the neighbouring articulations. Rest of injured parts is also essential, and this may sometimes be secured by the application of splints of one kind or another. This therapeutic measure will come to be discussed and insisted upon particularly, in the chapters on injuries and diseases of bones and joints. As the solution of continuity is filled up, the edges are approximated; and during cicatrisation the same means must be persevered in, in order to promote the process. Support may be given in some stages of the cure by bandage, and occasionally by plasters: care must, however, be taken that this is not partial. It is seldom, indeed, that any good is seen to arise from drawing together by plasters the edges of a recent solution of continuity, during the progress of granulation and cicatrisation. The contraction of the part takes place naturally, and generally with sufficient rapidity. It is often retarded by the means which are foolishly employed to hurry it on; the granulations are absorbed, the surface of the sore becomes foul, the discharge thin and offensive; and if the plan be persevered in, inflammation of the surrounding skin will follow, with exten-

sion of the sore by ulcerative absorption. There is a period, however, at which the edges of a solution of continuity in a state of suppuration may sometimes be approximated and retained with every prospect of abridging the cure, provided the surrounding parts are in a sufficiently lax state, viz: when the discharge begins to thicken and diminish in quantity, when the granulations are florid, small, and acuminated; then, indeed, rapid adhesion often takes place. This I have often witnessed in stumps which had taken on an unhealthy action, from the state of the atmosphere, and in which the flaps had fallen away from each other; also when, in consequence of profuse hæmorrhage from the stump, it had been necessary to tie the principal arterial trunk of the limb. By watching the proper opportunity, firm union has been secured in an inconceivably short period. I have at present under care in the hospital, a patient from whom a very large fatty tumour of the back was removed; the cavity had somehow been allowed to get filled with blood: this putrefied, the wound gaped and discharged most profusely for some time; in the happy moment the edges were put together, and dressed as a recent breach of surface; in two days the cure was all but completed. In the treatment of wounds made in the various surgical operations, much will depend, as regards the course to be followed, upon the care that has been taken to give them a proper and favorable direction, and to preserve, as in extirpations and amputations, the due proportion of the different tissues to each other.

When the coverings have been smoothly and cleverly cut in the direction of the fibres, and when they are abundant as regards the deeper parts, then, after the surface has become glazed, (the vessels having been tied, and the cold water assiduously applied for some hours,) the surrounding skin, previously shaved, is made thoroughly dry; coagula are removed; the edges are put carefully and neatly into contact, and retained by narrow slips of adhesive plaster placed at intervals. The plaster commonly used is not well suited for the purpose; it does not retain its hold sufficiently long; it is loosened by discharge, heats the surface, and often gives rise to erythema. For many years, a better sort of plaster has been

used very successfully, by some of my colleagues and myself in the Royal Infirmary of Edinburgh, and in the North London Hospital, as well as in private practice. It is composed of a solution of isinglass in spirit, and may be spread for use, as occasion requires, on slips of oiled silk; on silk glazed on one side only, and on the unglazed side. But this plaster can now be had, ready for use, admirably prepared by Messrs. Fisher and Toller, Conduit Street, and Bell, Oxford Street. It is cut into strips of the desired breadth, and the adhesive matter is dissolved immediately before it is employed by the application of a hot moist sponge. This composition becomes sufficiently adherent; it keeps its hold often to the end of the cure, and is quite unirritating. Being transparent, the plaster does not prevent any untoward process that may be going on underneath from being observed, and if any fluid collects, an opening can be snipped for its escape. If, as may be often deemed necessary, a few points of suture have been inserted, these can be removed by cutting the thread shortly after the fixing of the plasters, and within twenty-four hours after infliction of the wound. No other dressing need be employed in the first instance—no compress, no pledget, no bandage. These applications may give rise to unpleasant effects; they are not wanted, and do no good; they, in no way, promote the object in view, viz., union of the wound, and the cure of the patient at the end of eight or ten days. A roller may be applied in a few days, after some amputations, in order to encourage the subsidence of any slight œdema that may have arisen, and to bring the stump into a good form. At an earlier period, the use of any dressing whatever is productive of pain; it heats the part, and encourages discharge of blood and formation of matter. The discharge that does take place, during the light and simple mode of managing wounds here recommended, is wiped from the surrounding skin, as it flows out, and from the taffeta or glazed cloth on which the part lies. A great deal of suffering is thus saved to the patient, and he enjoys much comfort and cleanliness; besides, the surgeon is relieved from a load of most unpleasant and harassing duty. The suture employed to adjust and keep together the edges of a wound during the first period, whilst the

cold water is applied, and until the adhesive plasters have become firm, should be of the interrupted kind. The thread of waxed staysilk, thick or thin, according to the size of the wound and the degree of retraction, is introduced by means of a sharp needle, well set, and in good order. The needle most manageable, and most generally applicable, is but slightly curved towards the point. This form of instrument is in general preferable to the old crooked surgical needle; but in some few cases the latter is more convenient, as in making suture of the alæ of the nose to the cheek, required after some of the operations on the upper jaw, and after the rhinoplastic.



The interrupted suture is here represented; the lower stitch, however, is incorrectly drawn, to contrast, perhaps, with the upper or real reef-knot. The needle is carried through the skin only, on one side from the surface, and on the other towards it. The distance betwixt the stitches must depend on circumstances; of course the fewer inserted the better, seeing that the proceeding is uncommonly painful, and often more complained of than severe and extensive precedent incisions. The points of suture had better be taken out early, although in many instances, when the parts are not on the stretch, they do not produce much excitement. A case occurred to me lately in private, where amputation of the thigh was necessary. The patient had fully made up his mind to bear the pain attendant upon it, and he did so most heroically; but he would not suffer me to approach him within arm's length, for any purpose afterwards. He screamed, and almost fell into convulsions, when I attempted, on the day succeeding the amputation, to remove one of the sutures. He suffered no inconvenience from their presence, and cut them across himself at the end of ten or fourteen days, with scarcely enough of discharge

surrounding them to permit their easy withdrawal. Their presence caused him no uneasiness, and there was no excitement of the parts at any period.

Under some circumstances, and in some instances, the rule laid down as to the propriety of delay in putting together the surfaces of wounds, and closing them permanently, may be departed from with great advantage, as when the entire surface can be brought into close and accurate apposition, so that no clot of blood can by any possibility be interposed; as, for instance, in penetrating wounds of the mouth, or in divisions of the lip, and in some deficiencies, natural or accidental, of the genital organs in either sex, where the surfaces can be intimately joined by means of suture only. In some such cases the twisted suture is preferred, in others the quilled may answer, as in fissure of the perineum of the female. Whichever is used,—and, in fact, wherever immediate union is desirable, so as to prevent deformity as far as possible,—no dressing should be applied: the practice generally is, to put on strips of plaster, or to cover over the part with a piece of lint, smeared with healing ointment—as some choose to call it—or to interpose dossils of lint betwixt the ends of the pins and the skin, and by a uniting bandage to support the parts, and take off the strain, as is said, from the suture. All this is mischievous, and a remnant of the old meddlesome surgery. Any kind of application collects and retains the secretions, promotes discharge, heats and excoriates the surface, and naturally interferes with the process of union. The twisted suture, sutura circumvoluta, will be represented and explained in Chapter XV.; the quilled suture is here shown. A few double ligatures are drawn through by means of a small single one, and in the loop of these a piece of bougie or quill is laid. Or the double ligature may at once be passed; the loop is cut so as to disengage the needle; the ends on one side are then knotted over the quill, and the other ends being drawn tight are secured on the opposite side over another quill. Thus the deeper parts are brought into contact, and union, it is thought, more effectually provided for in some instances. In tying all

silk or thread ligatures, what is called the "reef-knot" is used,—difficult to describe, but well represented, as ready to be drawn tight, in the plan p. 30, and in others throughout this work. Ligatures of wire, (a composition of platina, &c.,) possessing great ductility and strength, have been used in some situations. They are introduced by means of a short needle, with a female screw in one end, held in forceps, or in a porte-aiguille; the parts are approximated and retained in contact by carefully twisting the ends.

The propriety and necessity of strict attention to the general health of a patient who has suffered from injury, or has been the subject of a surgical operation,—with constant observance of the state of the circulation, the condition of the stomach and bowels, of the skin and kidneys, and their different secretions,—cannot be too strongly impressed upon the young medical practitioner. If these circumstances are overlooked, if the constitutional treatment is neglected and slurred over, nothing can proceed favourably, the best and most brilliant manipulations will be thrown away; and however much disturbance of the system may be arrested, or calmed, by the prevention or removal of local irritations, this will assuredly go for nothing, if the functions of the internal viscera are permitted to become deranged. A skilful surgeon will, by observing the condition of an exposed surface, very often detect the presence of constitutional disturbance long before any mischief has been indicated by the state of the pulse or tongue, or of the secretions and dejections. By the colour of granulations, the appearance of the edges, the character and quantity of the discharge, he is put upon his guard; he is able to meet the coming storm, and to arrest much general and local disturbance. A surgeon, moreover, must look, more especially in some states of the atmosphere, to the ventilation and warmth of the apartments in which his patients are placed; he must take care, in hospital practice, that there are not too many individuals lodged in the same apartment. He must prohibit the sponging of sores, and scrubbing away the matter that is poured out upon them for the protection of the granulations; he must separate those labouring under erysipelas from those that are unaffected; and he must be especially careful not to check discharge from

sores suddenly, or to irritate their surfaces, and the integuments surrounding them, more especially if the season be unhealthy.

In conclusion, it may be observed, that if an operation be well performed, and the patient quickly freed from his malady, with comparatively slight suffering and without great loss of blood, his hopes of recovery being high, the after treatment is exceedingly simple, and indeed but very little is required.

In cases where there is profuse suppuration, or the patient is much reduced by any discharge, or otherwise weakened, so that he lies long in bed, and probably constantly on his back, the surgeon will do well to direct his attention to the state of the chest. From the feeble state of the circulation, congestion is very liable to occur in the posterior part of the lungs; this is followed by pneumonia, which will frequently prove the immediate cause of the patient's death.

CHAPTER III.

ON INJURIES OF BONES.

Injuries of the osseous tissue are generally produced by the application of a considerable degree of force; and if this has been made directly to the part that has suffered, the soft parts must of necessity be more or less contused. Even when the continuity of a bone has been destroyed by force applied at a distance—to its extremity, for instance, and in the direction of the shaft—if any displacement has arisen in consequence, the deeper-seated muscular and cellular tissues must be torn to some extent. Effusion of blood will ensue: the capillary vessels, bruised and deprived of their contractility, will speedily become gorged, and a greater quantity of red blood will be admitted into them; ecchymosis proportioned in extent to the degree of laceration, and the size of the branches implicated, must be the consequence. The injuries of some bones come to be considered also in reference to the organs which they contain, and which they are intended to protect. These are often affected in a serious manner; their functions are suspended for a time, or may be entirely destroyed.

The process of reparation takes place in a different manner in some bones from what it does in others—in some the process is completed readily and rapidly, in others much more slowly. Some bones are repaired only by membranes, if there is any considerable loss of substance; others are united by ligamentous matter under many circumstances; and again, fracture in some situations is united almost uniformly by cartilage only. The rapidity and perfection of union will greatly depend upon the

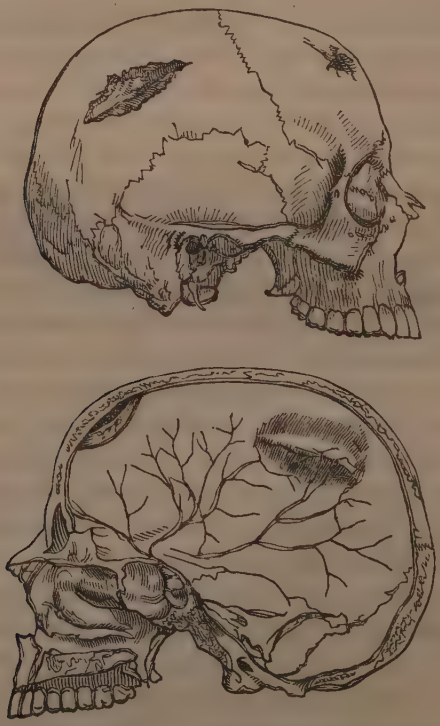
degree of lesion, and upon the mode in which the treatment has been conducted. The injuries of the flat bones may first be considered, as perhaps the most dangerous in their consequences, and the most difficult to treat; the most important, on these accounts, for the practitioner to understand thoroughly. This remark applies, at all events, to the fractures of the bones entering into the formation of the cranium, and of the pelvis.

FRACTURES OF THE CRANIUM.

The cranial bones, in the young subject, bear a considerable degree of pressure without breaking: like other young bones, they may be considerably changed in form, without solution of continuity occurring to any extent. The displaced portion will sometimes again return to its original level; but, after adult age, and more especially in those advanced in life, fracture of one or both tables is readily occasioned. The fracture, at any particular point, may be the result of force there applied; or the part struck may remain entire, whilst a breaking up and splitting of the bones may be found to have occurred on that opposite where the resistance has been made, as when the head has been driven down upon the top of the spine by a blow on the vertex. This fracture of the basis cranii has been otherwise accounted for. It has been said, and perhaps truly, that when pressure is made upon the crown of the arch formed by the parietal bones, by their expansion, the temporal and sphenoid bones which bind and tie them together, are apt to be torn asunder and split. Very little can be done to remove the bad effects of such lesions; the injury is often so extensive, there is such laceration of the vessels, even of the large venous sinuses, that blood is effused copiously, and exerts upon the most vital part of the nervous system prejudicial and fatal pressure. The termination is not long delayed in the majority of instances. In other cases, when, from the occurrence of bleeding from the cavities connected with the bones of the base, followed by purulent discharge, (though these are by no means unequivocal signs of such injury,) there is good reason to suppose that fracture has occurred, the patient lingers on, and may ultimately be restored to health. The surgeon can

interfere only to avert or moderate inflammation, if it should occur.

Fractures of the upper and more exposed parts of the cranial bones may involve a great portion of one or more of them, though there be no displacement; or a great part of both tables may be driven under their proper level; or, again, the external opening in the bone may be small, and the internal table may be very extensively detached in splinters, as exhibited on the anterior fracture in the two sketches annexed.



In the first and second forms, the fracture may be simple or compound: in the last, it is almost always compound and comminuted, in consequence of the peculiarly brittle nature of the inner layer. The fracture with extensive depression is generally the result of a blow by an obtuse body, or of a fall upon some smooth, hard substance of considerable surface; the external

parts may be divided or not. But the punctured fracture, on the other hand, is occasioned by the application of a sharp or pointed body with considerable force; and this can scarcely occur in such a way as to affect the bones, without previous division of the common integument and other coverings, probably of the dura mater also. The comparative danger does not arise from the circumstance of the fracture being attended by a wound, but in consequence of the effect upon the internal table and contained parts.

A large portion of bone may be driven down, without any permanent disturbance of the functions of the brain; the patient may be stunned, may suffer from the effects of the shock for some time, and gradually recover, as he may and often does, without any lesion of bone or other part; or on the other hand, he may be affected by deep and continued stupor, which can only be relieved by replacement of the depressed bone, raising it to its proper level. The insensibility consequent upon commotion of the cerebral mass, and disturbance of its circulating system, must be carefully distinguished from the symptoms of compression of the organ. The former is always the immediate result of injury. Its duration varies from a few minutes to many hours or days. The general circulation is low and weak, the surface cold, the respiration, though difficult, rarely stertorous. The patient sometimes empties the stomach of its contents; he has a rigor, and this is generally the precursor of reaction. The circulation is gradually restored, if means, such as early venesection, have not been resorted to, which are calculated to prevent reaction, and which when employed, often enough lead to extinction of the vital functions. The stupor in concussion is rarely complete. The patient can be roused, and answers hurriedly and impatiently, in monosyllables: the circulation is irritable, and by motion of the body may be increased remarkably in rapidity. The pupils are generally contracted; sometimes one is so affected, the other dilated; at first they are insensible to the stimulus of light; often enough, however, this may arise from more or less compression of some part of the brain, as by effused blood. In many cases of what is looked upon merely as concussion, the base of the skull has suffered consider-

ably; blood lies on some part of the brain, its substance may be torn, and the symptoms and signs are thus mingled and confused: the muscles are sometimes relaxed, at other times rigidly contracted and convulsed. As the case proceeds, the symptoms change their character; those indicating inflammatory action are apt to supervene, such as rapid, sharp pulse, signs of violent suffering in the head and delirium.

Compression of the brain, again, whether occasioned by effusion of a quantity of blood upon the organ, or in its substance, comes on after the lapse of some time. The patient is stunned from the first, but, after a few hours, he falls into a state of great stupor, or deep coma. He may recover almost entirely from the immediate effects of the shock and stunning: he may become warm, the circulation may be restored, and his sensibility return; but this is shortly succeeded by insensibility. In cases where the brain is at once compressed, and a portion of its substance displaced, with or without wound, perfect insensibility exists from the first. The patient cannot be roused; his pulse, after reaction has occurred, is slow, as is the breathing; the limbs are supple, the pupils dilated and fixed, the sphincters relaxed. These symptoms occasionally, though rarely, abate; generally they continue unabated, and if means cannot be devised to remove the pressure, the patient sinks. His dissolution may take place without much change in the symptoms, or there may ensue an inflammatory attack, followed by additional effusion.

Extravasation of blood often takes place to a great extent, and at an early period after the injury, as when a vessel of large size is torn; the exact situation of the extravasation is with difficulty ascertained; and even if it is, and is situated so as to be reached with any degree of safety, it cannot be removed, at all events, surgical interference, by operative procedure, offers but little prospect of benefit to the patient. The practice has been advocated; and I have even seen it resorted to, but with no encouraging result.

[A very interesting and rare instance of benefit following an operation under these circumstances is given by the late Dr. Physick. A boy was struck on the os frontis; he complained

of pain at the part, but in every other respect was apparently very well. Dr. P. was sent for, and found him relating, with minuteness, how he had been injured. "While I was there, he fell down insensible; the attendants thought him dying, and objected to my doing any thing; but I insisted upon perforating the bone, and evacuated a large quantity of blood. The boy recovered."—*Hodge's MS. notes of Dr. P.'s Lectures.*]

The upper part of the brain often bears, from the first, a great deal of pressure with impunity; or it becomes accustomed to it, and the symptoms gradually abate, the patient recovering with a great portion of bone completely under its natural level. This was the case in the camerated fracture of the parietal bone, as it it has been called, an external and internal view of which is given at page 36. The patient, after a great many weeks, perished solely from the effects of a fracture of the sacrum. Patients have had extensive depression, with wound of the brain and membranes, large portions of the organ have been discharged, symptoms of compressed brain have existed for some time, and ultimately, without any interference with the bone, the symptoms have abated, and a complete recovery has ensued. It is the disturbance of the substance of the organ, or of the circulating fluid at the base of the brain, that more immediately gives rise to serious symptoms. The cavity of the cranium being always full and the brain incompressible, pressure from effused blood or depressed bone on the upper part of the brain will, more or less, affect its base.

Injury to the side of the hemispheres or to the anterior lobes produces much less serious symptoms, and cases occur of compound fracture and elevation of the orbitar plate of the frontal bone, where the patient recovers without the occurrence of severe symptoms.

If the stupor is intense, and no signs of amendment appear, in cases where a portion of both tables of the cranium is driven down upon the contained parts, then the surgeon will act wisely in relieving the brain without delay from this prejudicial and dangerous pressure.

The nature of punctured fractures (radiated and star-like, as they are denominated) has already been noticed; the presence of the numerous sharp spiculæ of the internal table upon the

surface of the dura mater, for even a short period, is almost uniformly followed by intense inflammatory action, propagated to the brain and its more immediate investments; and this is the more likely to occur, if any of the spiculæ have penetrated the membranes. At all events, if the patient escape the danger, he is apt to suffer, at a later period, from abscess under the bone, occasioned and kept up by the dead portions. The internal table is sometimes only partially detached in young subjects, and bent down, as it were, on the membrane. These cases demand interference, either immediately upon the occurrence of the injury, even though the symptoms of oppressed brain or disturbance of its functions do not exist, or at a later period, for the evacuation of matter, and the removal of the cause of the abscess. The following case may be here given in illustration.

Case.—"H. N., aged eleven, was admitted, by the recommendation of Dr. Bain of Poplar, into the North London Hospital on September 16th, under the care of Mr. Liston. Eleven weeks since, while riding in a cart laden with ginger-beer, the vehicle was upset, and the boy received two wounds in the head, from the broken fragments of the stone bottles. One wound was situated on the posterior, the other on the anterior and superior part of the head. The posterior wound was an incised one. It is now healed. The anterior was a punctured wound, from which was taken an angular piece of bottle, and it still continues to discharge matter. He was insensible for one week after the accident, from which state he recovered by degrees so that at the end of a month he was able to walk about; but, a few weeks afterwards, he for three days lost the power of speech, which he recovered on a profuse discharge of matter taking place from the wound. He has had several attacks of insensibility, their duration varying from two or three to twenty-four hours.

"Mr. Liston examined the anterior wound with a probe, which could be passed nearly an inch and a half in the wound, somewhat in a perpendicular direction, showing that an opening existed in the bone. He was of opinion that some portion of the bone was depressed, or that the inner table was frac-

tured, and perhaps loose on the dura mater, which was the cause of the profuse flow of pus, and of the symptoms above detailed.

"On the 19th, Mr. Liston proceeded to use the trephine. The anterior part of the head having been shaved, he made a V-shaped incision, including the opening already existing, the apex of the flap being towards the nose. The flap being dissected back, a fissure was discovered, about an inch in length, extending from the original wound towards the apex of the flap. The fissure was filled up with membrane, except at one point, where an opening existed, with some little depression of bone. A small trephine, was then applied on one side of the fissure, near the opening, and a piece of bone removed. An angular piece of the inner table, projecting much inwards, was found attached to the circular portion. On the opposite side of the fissure was observed a similar depression of the inner table, which was also removed by the trephine. Some small spiculæ were picked out from the surface of the dura mater with the dissecting forceps, the flap was then laid down, and retained on each side by sutures, the apex being left free. Lint, dipped in cold water, was applied over the wound, and he was ordered to be placed in bed with the head elevated, and to be kept quiet. Cold water to be applied every quarter of an hour, until all oozing of blood has ceased.

"Seven hours after the operation, the blood ceased to ooze. Two strips of isinglass-plaster were then applied on each side of the flap, leaving the apex free, to allow of the ready escape of any secretion. The stitches were removed, and warm water dressing was applied to the points which were uncovered by the plaster.

"Nine o'clock, P. M. Has had some pain in the head; pulse 101; skin rather hot and dry; feels disposed to sleep. To have a saline purgative, with tartarized antimony, every four hours.

"20th. Slept well until late this morning, when he became rather restless, and vomited several times. No pain in the head; tongue dry; pulse 108, small; bowels not open. To discontinue

the antimonial medicine, and to have a purgative enema.—*Vespere.* Bowels freely moved by the injection; the sickness has ceased; pulse 120, fuller; skin moist; no pain in the head; tongue cleaner; low diet. Every thing went on favorably afterwards, and he left the hospital well on the 4th of October."—*Lancet*, Oct. 1836. Some good cases in point will be found in the "Elements of Surgery."

Abscess occasionally forms betwixt the dura mater and bone, as a consequence of contusion. The symptoms, of course, do not appear for some time after the injury. The patient becomes feverish; his rest is disturbed; he complains of tightness, and pain in the head and back of the neck. Rigors, followed by flushings, and sometimes by convulsions, supervene. Signs appear externally, in some cases, indicating the mischief going on underneath, and also the site of the collection. The scalp, if it has not been divided to any considerable extent, appears œdematous, and has that peculiar, soft, boggy feeling, which conveys through an experienced finger a conviction of the existence of purulent matter at some point, although perhaps in small quantity. If the scalp has been divided, the edges of the sore become swollen; the discharge is suppressed for a time and then becomes thin and gleety. The pericarnium separates, and the exposed bone shows every sign of lost vitality. It is pale or ash-coloured, and bloodless. If at this period the dura mater be exposed, the probability is, that a small quantity of thick and adherent matter will be found on a detached and discoloured surface. A perforation may probably be found to exist, leading from this depot to the surface of the arachnoid, or perhaps into one of the sinuses. Some of the signs of abscess may exist without others, as death of bone to some extent of surface and thickness, without the symptoms above detailed having preceded the necrosis. An opening may and has been made in such cases, and the dura mater has occasionally been found firmly adherent. The surgeon will sometimes be deceived, not as to the existence of abscess, but as to its site, and he may fail in reaching the collection and giving relief; as when matter has formed on the surface of the pia mater, or in the cerebral substance, in which case the symptoms are occasionally less urgent; for the constitutional dis-

turbance is often not so great in such cases, as when the accumulation, even to a small extent, occurs immediately under the bone.

For the purpose of raising depressed portions of both tables of the cranium, which give rise to continued and deep coma; for the removal of foreign bodies; with the view of taking away spiculæ of the internal table, which by their presence are almost certain to occasion dangerous inflammation; or lastly, in order to reach and evacuate matter, which may, from the rational symptoms and sensible signs, be supposed to exist under the cranium—the surgeon will occasionally be called upon to expose part of the bone, and make one or two perforations through it. The general and constitutional treatment of injuries of the head, and their consequences, is now much better understood than formerly. The danger of still farther widening any breach in the bone, exposing the membranes of the brain, and leaving them without their due and accustomed support, is now fully appreciated. Operations are accordingly seldom resorted to primarily without the most urgent and pressing necessity; and again, secondary symptoms are less frequently permitted to arise or gain ground. Trepanning of the skull consequently, which with our forefathers appears to have been an every-day occupation, is an operation, at this period, very rarely resorted to.

[Rough splinters of one or both tables of the bone very frequently press upon, or are driven into the brain, without producing symptoms of compression; and where this state of things exists, unattended with wound of the scalp, a rigid antiphlogistic treatment will not unfrequently effect a cure without any interference on the part of the surgeon. In cases, therefore, of simple depressed fractures of the skull, the trephine is not called for unless at the same time symptoms of compression of the brain are present; and even then, the operation should not be done until the effects of free depletion has been tried. If the symptoms of compression do not abate under this treatment, then the trephine should be resorted to. When, however, depressed bone exists in connexion with wound of the soft parts, the trephine or elevator should be at once used, whether symptoms of compression of the brain be present or not; as in these cases experience proves, that the depressed bone most generally occasions inflammation of the brain and membranes, which, having once set in, cannot be relieved, and will probably only be aggravated by the

application of the trephine. True it is that compound fractures, with depression, are sometimes not followed by inflammation, and do well without an operation; this, however, we cannot be certain of, and as the mere removal of the depressed portions, in these cases, cannot of itself in any way increase the danger, even should no benefit follow, it should in all instances be done.]

The instruments proper and essential for exposing and dividing the cranium for any of the ends above noticed, are a strong, sharp-pointed bistoury, a large and small trephine (those fluted so far outside are to be preferred, being more readily inclined, in order to divide bone of unequal thickness, safely,) an elevator, and Hey's saw, with straight-edged blades. The trepan is now almost entirely disused; it can be employed safely enough, and the perforations are perhaps made a little more quickly; but this is no great object. The division of bone is not attended with pain, the patient is almost perfectly insensible, or, on the other hand, the portion of bone operated on is dead; and it is not now customary to make a dozen or twenty perforations at a sitting, as some of the old surgeons did along a fissure, or in search of extravasated blood. A few minutes, more or less, spent in perforating gradually and safely, are not to be considered as time thrown away. The raspatory and lenticular, still added by the instrument-maker to swell out his case, are not now, or should not be, employed; the one is intended to denude the bone; this should be done to but a small extent, only so as to permit the application of the crown of the trephine, and can be effected by the point of the knife and dissecting forceps; the other was used to smooth the edge of the opening, but cannot be used without unnecessarily detaching the dura mater. Any sharp spine in the opening can be easily removed by the careful employment of the elevator.

In operating on cases of fracture with depression, the injured part must be exposed by dividing the scalp. The direction and extent of the incisions will depend upon the nature of the injury which the bone has sustained, and upon the state of its coverings. If the scalp be not wounded, the bone may be exposed, to a sufficient extent to show the depression, by two incisions, the one falling at right angles upon the other; and the flaps, so

made, are then reflected. The longer incision should be made in the direction of the fibres of the occipito frontalis, and formed at once by carrying the point of the knife down to the bone, drawing the instrument along so as to divide all the layers at once. Some care may be required in cutting over that part of the bone which is broken, and the knife must not there be carried so deeply as to endanger the parts underneath; yet he must be a very incautious person indeed to whom such an accident could happen. The injured portion of cranium may be exposed by a corresponding accidental division of the scalp, or a slight extension of the openings may suffice to afford a proper view and facility for the after proceedings. If one or more small openings exist, the form and direction of the incision ought to be varied so as to include them. To expose a puncture of the skull, one flap will often be sufficient, the corresponding opening in the scalp being left untouched in the middle of the raised portion; or an incision may be carried a little on one side of the opening, and another made through it so as to fall upon the first. Two flaps are thus formed and raised, bringing fully into view the perforation, and admitting of its enlargement. This form of incision is to be preferred, the apex being dependent; and the same will be found to answer very well for opening the puffy swelling and collection over any piece of bone which it may be considered necessary to remove, in order to evacuate an abscess upon the dura mater. If, in such a case, there is a wound, it may be included in the incisions, or raised in the flap, if small.

Some depressions may be raised, by a careful use of the elevator, without any removal or even depression of bone. This instrument should be of the most simple kind, one end a little smaller than the other, and a little rounded off. The point of this instrument, when the fissure is wide, may be insinuated under the depressed portion of bone; and, by making a fulcrum of that which is sound, the object of raising it to the natural level may be achieved. A small portion of detached bone may sometimes be picked out to make room; or again, the fissure may be widened by the judicious employment of the small straight cranial saw so as to admit the elevator. This saw can

only cut in a straight line to any depth. The convex-edged blades, which are said to be intended for making curvilinear sections, are utterly useless for this purpose. A groove swerving from a straight direction may be made by one of these tools, constructed more for sale than for use; but it will puzzle the most dexterous mechanic to do more—to cut with them even to the depth of a line to any extent. They may be employed perhaps with advantage in dividing bone of unequal thickness, as when there is a spine underneath. The straight one is recommended by Mr. Hey to be used first, then the one with the rounded blade.

In order to gain space for the disentanglement of the depressed bone, and for the efficient application of the elevator, it is in many cases necessary to remove a circular piece of bone. This is generally done, so as to attain the desired object most readily, as near as possible to the point where the force has been applied. In very bad and extensive fractures, large portions may be found entirely detached and loose, but very frequently the depressed portion is not separated: on one side the bone is cracked and bent down; that part which has been struck is generally driven more deeply towards the cavity, and is wedged under the sound portion. By removing part of the latter, the elevator can be introduced with advantage under what is depressed. The crown of the trephine is therefore applied so as to overlap slightly the injured part, and to remove the broken edge. The centre-pin extruded and fixed by a turn of the thumb-screw, can, by a few turns, be made to penetrate, and bring the teeth of the saw into contact with the bone. Then by holding the instrument lightly in the hand, and pressing only in turning it from left to right, an impression will soon be effected. When it has penetrated little more than a line, and the crown is sufficiently steady, the perforating centre-pin is withdrawn: the proceeding is then gone on with, the depth of the perforation is measured by the flat end of a probe or tooth-pick—the more carefully as the saw advances—the bloody detritus being wiped away from time to time. When the internal table is approached, (and this may sometimes be guessed at by the facility with which the instrument moves, by the change of sound, and the greater quantity

of bloody matter which oozes out by the side of the trephine,) and, at all events, after proceeding to a certain depth, greater caution must be observed. The thinness of the bones in young subjects, and in many old ones also, together with the extreme density in the latter, must not be overlooked; more frequent probing must be made, the instrument must be used with scarcely any pressure, and must be inclined according as the division is found to be completed, or nearly so, at different points. The circle being loosened, it is easily removed by the point of the elevator. In some cases a second perforation may be found to be absolutely necessary before matters can be put into a satisfactory train. When the trephine is applied for other ends, one perforation will in general be sufficient, and it must be made with the same prudent precautions as here inculcated. In those parts of the cranium where the bones are known to be of very unequal thickness, and where the large venous sinuses traverse, of course still greater care must be taken.

After perforation of the bone is completed, and the object for for which it was undertaken accomplished, the flaps are to be replaced and retained by a point of suture, by a strip of plaster, or by compress, according to circumstances. Lint soaked in tepid water, with oiled silk over it, will generally be found the best dressing. In some cases it may be well to give some support to the membranes, as when a large portion of bone has been necessarily removed. This is effected by the application of a compress of lint, retained by bandage. Various split cloths, as they have been called, were at one time used, for the purpose of making pressure, on different parts of the cranium, and for retaining dressings; a handkerchief well applied, or a night-cap, will often answer perfectly. A double-headed roller may be turned round the head, in such a way as either to compress any one part, or to give uniform support to the whole.

FRACTURE OF THE PELVIS.

This must always be looked upon as a serious injury. Many cases are almost necessarily fatal, and that within a very short period; others, again, are attended with very great danger to

life; and all are more or less hazardous, and often troublesome to manage. The risk attendant upon this injury is increased by lesion of the contained parts. The fracture is slow in being repaired; and if the portions are not preserved perfectly steady and immoveable, extensive and deep-seated abscess, not unattended with danger to life, may be the result. Fracture of the pelvis is the consequence of great force applied directly, or through the medium of the head and neck of the thigh-bone, by a fall from a great height, or from a violent crush by a heavy body either falling upon this region or passing over it. A person slips, for instance, from the rigging of a vessel, or from the top of a house in progress of building, through many floors, and alights on his fork; there ensues a fracture and diastasis of the pubes, probably with injury of the urethra. Or he is crushed by the falling of a mass of earth, or by a loaded wagon passing over the lower part of the trunk. The signs are, inability to use one or both limbs in progression, great pain in the region, and, perhaps, the evacuation of bloody urine, or a total cessation of its flow. These signs make this injury much more serious, and especially the evacuation of bloody urine. The bladder may have been ruptured either from its being full when the weight fell upon or passed over the body, or the sharp point of the fractured bone may have penetrated it; in either case, effusion of urine into the surrounding cellular tissue or peritoneal cavity may give rise to fatal abscess or inflammation. The urethra is also not unfrequently torn, either by a fragment of bone, or by direct violence from without. The signs will be found to vary, and the facility of detecting these fractures will depend upon their site and extent; sometimes we must depend upon rational signs only, it being often impossible to discover crepitation, or to ascertain displacement. The nature and degree of the force applied is considered; the patient is sensible of grating in the bones in moving the trunk or limbs, or in having them extended for the purpose of examination. The solution of continuity may exist in various parts of the bones; the crest of the ilium is sometimes broken off, the ossa pubis are broken close to the symphysis, or this may be separated without much fracture; the fissure may pass through the obturator fora-

men, the rami of the pubes and ischium being broken, and it may involve the acetabulum; if so, the corresponding limb is disabled, and it may probably be everted, in consequence of the bruising of the glutæi. Crepitation may often be detected by the hand, by the ear, whilst the limb is being moved, or by the fingers passed into the bowel. Sometimes the sacrum suffers solution of continuity; it is broken transversely or longitudinally, and generally the fracture is comminuted. This is caused by the application of great and direct force; the fracture is not easily detected, and it is slow in uniting. Due attention must be given to the injuries of the viscera, as explained in Chap. XII. The catheter must be used frequently, or retained; incisions of the perineum may be required. The patient must be kept quiet and in the recumbent position, and that for a considerable time—for many weeks at least. A bandage may be applied in the first instance, and afterwards a broad band is passed round the region, and fixed by buckles. If there be reason to suppose that the cotyloid cavity is implicated, the motion of the corresponding limb must be restrained. It is best kept steady by the application of the long splint, described and represented in treating of fractures of the thigh; but there is no occasion for tightening the perineal band so much, or even for its application at all, there being no shortening of the limb to counteract. Antiphlogistic means must, of course, be resorted to, according to the nature and violence of the symptoms. If the patient is kept quiet, and the parts steadied and fixed from the first, these will scarcely be required.

Fractures of the sternum and scapula do not require any very peculiar treatment, and will be noticed under the head of Injuries of the Chest, and of the Upper Extremity.

FRACTURES OF THE BONES OF THE FACE.

Fractures of the bones of the upper part of the face are not attended with much displacement. The ossa nasi are occasionally dislocated, with or without fracture; these injuries are produced by direct violence, and are generally compound; for if the skin escape, the Schneiderian membrane is certain to be wounded. There is profuse effusion of blood from the nares,

often followed by inflammatory swelling, and sometimes by abscess and destruction of the cartilages and bones. The parts are easily replaced by the introduction of a strong probe, or closed dressing forceps, into the cavities; an uncut quill will answer the purpose, if no other instrument is to be had. The bones are thus pressed into their places, and moulded by the fingers of the hand not otherwise employed; there is no great risk of their being again displaced, consequently no retentive apparatus is necessary. Inflammatory action may require to be moderated by general or local bleeding, purgatives, and fomentation. Abscess of the septum, if it occur, is to be opened early.

Fracture of the superior maxilla generally occurs from direct violence—gunshot wound for instance. It may be occasioned by a blow on the malar bone. A man lately presented himself at University College Hospital, who had slipped on a slide in the street, fell and struck with great violence the malar bone of the left side; he had sustained a vertical fracture through the orbitar process of the superior maxilla. In severe compound fracture this injury would easily be detected: in simple fracture, a fissure or slight irregularity would be felt, but much displacement rarely occurs. In severe compound fracture, if any of the bones were splintered, the fragments should be picked out, and the subsequent inflammation subdued by leeches, fomentations, and the usual constitutional treatment. Fracture extending into the antrum may cause subsequent abscess of that cavity, which will be treated of in another part of this work.

Fracture of the inferior maxilla is not unfrequently met with—the result of force applied either directly to the place which has given way, or to some distant part of the bone. It may be struck at the symphysis, and yield on one or both sides near the angle; or the force may have been applied to one side, and the solution of continuity may be found to have taken place at the other, about the insertion of the canine or first molar tooth. This fracture is always attended with wound of the gums and lining membrane of the mouth, with loosening of the teeth and loss of blood; there is often great splintering, and not unfrequently also wound of the integument. There is uniformly

more or less displacement: the shorter fragment being drawn towards the cavity of the mouth by the action of the mylohyoid and pterygoid muscles. It is also elevated by the temporal and masseter, the antagonists to which are cut off, as it were, from that side.

At first a good deal of difficulty is experienced in keeping the broken surfaces in immediate apposition; after swelling has taken place, the object is more readily attained. The treatment will be influenced a good deal by the presence or absence of the teeth; if any are much loosened by the splintering of the sockets, it may be prudent to remove them. If they are firm in the neighbourhood, a small wire may be passed round them on each side, at some distance from the fracture, and by twisting it the parts are put straight; or a machine with blunt hooks and screws, to be had of the instrument-makers, may be applied; or grooved, wedge-shaped pieces of cork or wood may be put along on each side, between the teeth of the upper and lower jaw, whilst the base is supported by a piece of pasteboard or leather, cut so as to make a proper case for the part, softened in hot water, and dried upon the face; the whole apparatus is secured by a double-headed roller, or split cloth, passed round the vertex.

INJURIES OF THE SPINAL COLUMN.

The immediate effects of concussion of the spine, and even of slight fracture with partial displacement, are sometimes recovered from. By judicious treatment, rest, and other antiphlogistic means, as well as by good fortune, some few persons who have so suffered have been perfectly restored to health. The sensation and power of motion, of parts supplied by nerves from below the injury, return perfectly, though perhaps slowly, and no bad consequences ensue. In other cases, however, the immediate effects may, in a measure, disappear; they are followed, sooner or later, by gradual loss of power and feeling in the lower parts of the body, loss of contractility in the bladder, with want of sensation in the nates and in the extremity of the intestinal canal, formication, weakness, and awkward movement

of the limbs. These symptoms indicate degeneration of the spinal chord, which sooner or later terminates in complete paraplegia. Fracture, with considerable displacement of parts, (and, without solution of continuity, luxation is rare,) is attended, as an immediate consequence, by paralysis, more or less complete, according to the site and extent of the injury. A good case of pure luxation of the cervical vertebræ is recorded as having occurred at the North London Hospital, under my care, in the Lancet, for 1837–38.

[The following is an example of this rare accident:—Thos. Lee, æt. 30, was admitted into the Pennsylvania Hospital early on the morning of September 9th, 1831. At 11 o'clock on the previous night, while in a state of partial intoxication, he had been thrown headlong against the curbstone from a gig that he was driving at a furious rate. There was complete paralysis of the lower extremities, chest, and lower half of the trunk. He complained of great pain over the lower cervical vertebræ; but so much swelling and ecchymosis existed at this part, that the state of the spinal column could not be satisfactorily ascertained. When placed in an erect position he cried out from pain, unless his forehead was firmly supported; and when laid on his back, his head was seen to be thrown a little forwards, and pushed down upon his chest. The hands and arms retained their sensibility, but he was unable to double his fist, or seize any thing firmly. His respiration was hurried, difficult, and performed entirely by the diaphragm; he complained incessantly of being unable "to breathe properly." Priapism existed, and continued constant till the period of his death. From the existence of the above symptoms, the case was looked upon as one of fracture, with consequent luxation of the lower cervical vertebræ. He was placed on his back, with the head and shoulders slightly elevated; had his bladder, which was distended, emptied by the catheter; and as his pulse was full, he was bled moderately. By 10 A. M. his sufferings had become so great, that Dr. Barton, the surgeon in attendance, deemed it proper to make some attempt to relieve them, by cautiously making extension and counter-extension. The extension was made by means of a handkerchief passed under the chin, the ends of which were tied firmly to the head of the bedstead, and the counter-extension was kept up by securing the ankles with a broad bandage, and fastening it to the foot-board. The patient expressed himself as being decidedly easier after the extension was made. On visiting him on the morning of the 11th, I found him without

pain, and with no apparent change in his symptoms. His position was in no way changed: and while in the room, engaged with another patient a few feet apart, my attention was directed by the nurse to Lee, and on approaching him, I found him dead.

Autopsy.—A considerable effusion of blood was found in the cellular tissue beneath the skin, as well as between the muscles on the back part of the neck. The yellow ligaments, and the ligamentous fibres, holding together the oblique processes, were ruptured, and the fifth cervical vertebræ was thrown forward upon the sixth. Examined in front, the vertebral ligaments were found to be also ruptured, and the inter-vertebral substance torn up, so that the body of the fifth was completely separated from and projected over the sixth. Accurate examinaton, after the removal of the upper part of the spinal column, proved that no fracture existed, and that the injury consisted in a simple displacement of both body and processes of the vertebræ. The examination was made twenty-eight hours after death, but owing to the heat of the weather, putrefaction had considerably advanced, and the spinal cord, the coverings of which were uninjured, was so much softened in its whole extent, that its state at the point of injury could not be determined.]

Fracture is produced by great force, applied either directly or indirectly to the chain of bones. The spinal marrow is torn, stretched, or pressed upon, by portions of bone, or by blood. Inflammation, and its consequences, may occur, unless carefully guarded against; the period at which a fatal termination is likely to ensue, will, of course, depend much upon the part that is injured; the higher in the column the more urgent are the symptoms, and the more complete the paralytic state. Some injuries of the spine are very quickly fatal; but even when respiration is somewhat interfered with, life is prolonged for a short time. The treatment can only palliate; motion of the injured parts is guarded against by position, and by the application of some sort of splint on either side of the spinous processes: the bladder is carefully attended to, and accumulation of urine, with its consequences, prevented. It has been proposed to make incisions on the broken bones, to examine the extent of the fracture and displacement, and to attempt removal of the pressure on the chord by trephining, by the application of pincers, &c. By these means, now generally and

very properly looked upon as unwarrantable, effused blood could not be removed, nor lacerations repaired, while the chance of inflammatory action would be much increased. Besides, it has been most satisfactorily shown by my friend, Mr. Gulliver, in the reports from Chatham, that the pressure is caused generally, by the broken body of the lower vertebra which projects backwards, and is completely out of reach of any operation whatever.

Fractures of the other short bones are not often met with, unless accompanied by much laceration of soft parts, and frequently by wound. The structure and functions of the limbs are destroyed, and very frequently the best chance of recovery is given to the patient by amputation. Simple fractures of the bones of the tarsus and carpus are not attended with much displacement; their existence is often not readily ascertained, in consequence of extensive bloody swelling having supervened. Fracture of the calcaneum may sometimes occur from direct violence, or from the same causes that produce rupture of the tendo achillis; the diagnosis of this injury is perfectly easy; then there is difficulty in extending the foot, and when the fibrous covering of the bone is torn through, the separation between the broken extremities will be apparent. The treatment is the same as that recommended for rupture of the tendo achillis. Perfect rest, elevated position, and antiphlogistic means only are required, as in sprain or bruise. When the two first indications are strictly fulfilled, nothing else but fomentation will be wanted. If inflammatory action is excited, it must be combated by efficient means, as local abstraction of blood. The use of cold and evaporating lotions is not indicated.

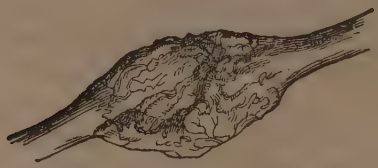
FRACTURES OF LONG BONES.

Solution of continuity, in the long bones, takes place in a transverse direction, obliquely, or longitudinally, as regards the shaft: the bone is rarely split without being broken across, except in cases of injury from gunshot, and then the fissure generally extends through the epiphysis into the articulation. Fractures are, besides, otherwise complicated by great laceration of the soft parts—by extensive effusion of blood into the joints or in-

termuscular cellular tissue—by division of arteries, of muscles, or wound of the integument. The existence of wound communicating with the fracture, produced either from within or from without, constitutes the compound variety. The nature of the fracture, and the degree of injury to the soft parts, will all depend upon the direction and intensity of the force which has been applied. Oblique fractures are generally the consequence of force applied in the direction of the axis of the bone; and when there are two bones, they often give way at different points, one low in the limb, the other near the upper articulating extremity. Transverse fractures may result from a blow on the part, from intense action of the muscles, or from sudden motion of the upper portion of a limb, whilst the lower is fixed and at rest.

If the direct violence is great, splintering of the bones is the result, with great bruising of the soft parts, followed by rapid and considerable swelling. Broken bones are always at first surrounded by a quantity of effused blood. This, if matters are allowed to proceed favorably, is absorbed in the course of a few days, and the process of reparation is commenced. The intermuscular tissue is often also loaded by effused blood. This latter often does not disappear completely for many weeks; lymph is effused, when the injury to the soft parts has been great, among the muscles, and even into their substance. Their fibre is changed in appearance; it becomes white, dense, and almost fibro-cartilaginous, when the excited action has been in-

tense, and when great inflammatory swelling has supervened. The functions of the muscles are suspended, and this tumour around the bones contributes much to steady them. Even gritty, earthy matter may sometimes be detected in the intermuscular effusion; when this takes place to any great extent, it is often traceable to some spicula of bone extruded from under the periosteum, which has contracted new attachments, and retained its vitality. Such fragments are often found at some distance from the fracture, and adherent to fascia, muscle, or tendon. The periosteum, which is necessarily torn, becomes more vascular: it is thickened for some distance above and below the injured part—plastic matter is secreted, and becomes organised—the wound in the membrane is repaired—lymph continues to be poured out by the vessels of the periosteum and bone, and occasionally also from the surrounding tissues; and the continuity of the separate parts is re-established by this organised mass.



The medullary cavity, to a certain extent above and below the solution, is also occupied by blood, and at a very early period by a similar secretion. Marrow and meditullium give place to a vascular and dense mass, in which spiculæ of new bone are soon discoverable: the cancellated texture is condensed, and disappears in the neighbourhood of the fracture.

Betwixt the ends of the bones, if well adapted, as they ought to be, to each other, a gelatinous looking matter is also poured out. In the deposit under the periosteum, upon the surface of the shaft of the bones, and in the medullary cavity, osseus matter is soon formed. A broad ring or ferrule of new bone, as represented above, though to rather an exuberant extent, surrounds the broken extremities, and these are still more securely held together by the internal plug. The shell of the bone becomes condensed for some distance above and below the solution

of continuity. The perfection of this temporary union may be looked for sooner or later, from the third to the eighth week, according to the age of the patient, the situation of the fracture, the degree of injury, and the care with which the treatment has been conducted. The deposit betwixt the ends of the bones is more slowly organised and ossified. Months often elapse before the union is so completed; when that is accomplished, the external deposit gradually disappears; that amongst the muscles has long before been absorbed, and free exercise of motion is regained. The cancelli too are again freed of the osseous matter which filled them, and the limb resumes very much its original form and functions.

When the ends of broken bones are permitted to remain displaced, when they project amongst the muscles, and ride over one another, there must of necessity be much greater excitement of the circulation in all the tissues,—involving a much greater degree of bloody effusion, and followed by more extensive inflammatory swelling,—than occurs in the condition of parts already described. If the patient does not succumb from the effects of inflammatory swelling, (which is never to be contemplated or dreaded, when the local treatment is well conducted, and when it is proper to attempt saving the member,)—if he escape the risk of gangrene or suppuration, a tolerably rapid and firm union may ensue, but necessarily accompanied by deformity, distortion of the limb, shortening and lameness. A greatly excited state of the circulation of the periosteum and bone, of long continuance, is the result of bad co-aptation and inefficient retention. An extraordinary effusion of lymph takes place, with great pain and swelling. The broken extremities soon become fixed permanently by the organisation and ossification of the deposit, and by the adhesion of the opposed surfaces of the periosteum. This membrane disappears, and the portions of bone lying side by side are consolidated; perhaps the consolidation may even be sooner effected thus than when the bones are placed straight, as nearly as possible in their natural position, with the broken surfaces in contact. The action is then slow and gradual; sometimes it appears to be almost too feeble, and barely sufficient to furnish an adequate uniting medium. The

confinement too is perhaps longer, or rather, it may be said, the functions of the limb cannot be resumed altogether so quickly when the cure is properly conducted, and the limb is left quite handsome and straight, as when, on the contrary, the patient suffers much pain and fever, has the limb pulled about, has the fracture continually interfered with, and is ultimately turned out of bed with a short and crooked extremity. The process of union in bones is effected in a similar way to that of the other tissues; it is, of course, modified by the degree of vascularity; the conversion of the organised lymph (which in all circumstances is the medium of union) into a substance similar to the original structure, is here not so rapid. The union may be delayed, or may ultimately fail to be effected by osseous matter, from a variety of circumstances; as from great and frequent loss of blood, or determination of it to other organs; from profuse discharge of matter in the vicinity, as in bad complicated fracture, when extensive abscesses form; or from bad management. The cure is sometimes interrupted by the frequent motion of the ends of the bone upon each other, in attempts to improve the appearance of the limb; or in consequence of the insufficiency of the retentive apparatus. The process of union in fractures complicated with wound is in all respects the same as in the most simple, though generally more slow. The lesion of the periosteum may be prevented from healing by the presence of splinters. The union may be interrupted in consequence of necrosis of the broken ends, to a greater or less extent. Also the action now and then flags in consequence of the excessive discharge, and the consequent general and local debility.

The object of the surgeon in the treatment of all fractures must be to obviate pain and suffering, to put the parts in the most favorable condition for being repaired, and to preserve the limb of its normal shape and length. All these indications are fulfilled by the same means, viz. instant co-aptation, and retention of the broken ends in the most perfect possible apposition. The earlier the means are adopted, the greater and more immediate will be the patient's relief from suffering, and the less the surgeon's anxiety and labour; excess of bloody and serous effusion will thus also be prevented, and the excited

action kept within bounds. Prevention, it is admitted, is always better than cure; and if the above recommendation is attended to, all necessity for local abstraction of blood, and for the use of lotions to cool the part, will be obviated. If, on the contrary, the limb is laid loosely on a pillow in an easy position, as it is by some thought or said to be, and no efficient means are employed to prevent the spasmodic action of the muscles, the startings of the limb, the jerkings of the broken ends, and the displacement of the fragments,—then assuredly, in spite of all local and general measures, there will arise frightful swelling, pain, tension, and heat; the intermuscular tissue will be gorged with blood, and the circulation of the limb roused to a dangerous and alarming degree.

The attention of the practitioner, when called to a case of severe fracture, will first be directed to the state of the nervous and vascular systems; he will have the patient placed as comfortably as possible in the recumbent position; he will take means to remove the effects of the shock, and to bring about reaction. He will then ascertain, with all convenient speed, the exact nature of the injury. This is done much more readily at first, and before blood is effused to any great extent; more so certainly than at a later period, when inflammatory swelling has supervened, and the sensibility of the parts is greatly roused. He will ascertain, as far as possible, how the accident occurred, and in what direction the force was applied; his attention will be directed to the pain, swelling, shortening, and distortion of the member, and the inability of the patient to raise it. He will, upon handling the part, discover unnatural mobility, and, upon extension, the ends will be found to grate on each other. The existence of fracture being thus put beyond doubt, means are then and there to be adopted, without delay, to favour the operations of nature. The limb is laid straight, and this is done at first with but slight effort, wherever the fracture may be situated. Extension is made with one hand, resistance with the other—such a position of parts having been chosen, as will relax any muscle, or set of muscles, that tend to produce distortion. Perfect co-aptation is in this way effected. Proper apparatus is forthwith applied; great care is also taken that there shall

be no interruption to the return of blood, and that this, in fact, shall be favored to the utmost by position, the limb being raised as far as is convenient above the level of the trunk. The effused fluid will then be speedily absorbed; the retentive apparatus will consequently in a few days admit of being re-adjusted; and the bandages are tightened, carefully avoiding any disturbance of the bones. No further local treatment,—unless for compound fracture, or in case of formation of matter or other untoward occurrence,—and very little constitutional management, will be demanded.

FRACTURES OF THE UPPER EXTREMITY.

Injuries of the bones which enter into the composition of the shoulder-joint, demand the most careful examination and attention of the surgeon. Some of the signs of fracture and of luxation are very much alike, and a mistake in diagnosis may occasion infinite trouble and annoyance to all parties concerned. The fearful consequences of applying great force in the case of fracture, or, on the other hand, of leaving for many weeks a dislocation unreduced, need not to be insisted upon here.

Fracture of the clavicle cannot well be overlooked or mistaken. This bone is generally broken about its middle; the motions of the extremity are weakened, and it falls downwards and towards the chest, carrying with it the scapular portion of the bone. The other portion is somewhat raised by the action of the sterno-mastoid, and is prominent under the skin: occasionally this end of the bone has been forced through the integument. The fracture is often oblique, and is caused by force applied in the direction of its shaft, as by falls on the point of the shoulder. It, however, happens now and then that the bone is broken by a blow upon it; the solution is, in that case, transverse; there may be also splintering, and sometimes wound of the soft parts. Fracture is met with near one or other of the extremities of the bone, and in such cases there is less displacement; the fragments are confined by the muscles and ligaments; the existence of the solution is not so readily ascertained, but the treatment is less difficult. In order to bring the broken ends into contact, the arm must be raised upon and removed from the chest. It is not

an easy matter to preserve this position. Part of the apparatus recommended and figured by Desault appears to be the most simple, and at the same time the most efficient. The thick wedge-shaped pad is the most essential part of it, and may be retained in its position without so much complicated bandaging as employed by that great surgeon. The limb is elevated; the pad, secured in the folds of a shawl, is then placed in the axilla, the thick part uppermost; the ends of the shawl are passed over the opposite shoulder, and tied in the arm-pit of the opposite side: soft pads are placed under the knots, to prevent galling and excoriation. Inclination of the arm to the side over the fulcrum so secured, and its still further approximation by a bandage passed round the upper arm and chest, will bring the broken bones into a proper position, and retain them. A well-applied sling, to preserve the elevation of the limb, completes the proceeding. In three or four weeks the union will be sufficiently firm; but perhaps the sling may be prudently retained a short time longer.

[At the Pennsylvania Hospital, where perhaps a larger number of recent injuries are treated than in any other similar institution in this country, the use of Desault's apparatus for fracture of the clavicle has of late years been entirely abandoned. As generally put on, the apparatus does not fulfil the indications intended, and when applied tightly and properly, so as to keep the fragments in perfect apposition, it in most cases produces great difficulty of respiration, or severe pain in the arm or chest. Besides this, it soon becomes relaxed, is easily deranged, and covers entirely the seat of injury, thereby making it impossible to ascertain whether or not the reduction remains complete, without the removal of a part of it. The apparatus used at the hospital consists in a pad for the axilla, a ring formed of some soft substance, as a roll of muslin or of buckskin, for the shoulder of the sound side, and a sling for the elbow made of linen extending half way up the arm, and two-thirds of the way down the fore-arm. To the elbow piece is attached three strong tapes—one to its upper and posterior part, and one to each anterior extremity. The following is the mode of applying the apparatus; a proper pad being selected and fixed in the axilla, by means of tapes fastened to its upper ends, and passing over to the sound shoulder, the ring or collar is carried up and held on the shoulder of the sound side; the sling is then fitted

to the elbow, and after the fracture is reduced by drawing the arm downwards and pushing the elbow upwards across the chest, the tape on its posterior part is carried over the back and firmly tied to the collar on the opposite side. This done, the surgeon comes round in front of the patient, and makes fast to the collar the tapes attached to the anterior extremity of the elbow piece. These are to be drawn tight enough to throw the shoulder sufficiently outwards and upwards to remove all deformity. The hand is then supported in a sling, or by a strip of bandage fastened to the collar. The whole apparatus is re-examined and tightened daily. The chief indications in the treatment of fracture of the clavicle are perfectly fulfilled by the use of this apparatus; the pad in the axilla throws the shoulder outwards, at the same time that the drawing up of the elbow by the linen bag, throws it upwards and backwards. Besides this it is simple, requires no bandaging, and leaves the part injured at all times open to inspection. The apparatus, too, can readily be applied in females, to whom it is all important to obviate deformity. To show the benefit to be derived from its employment in them, I may state, that I have treated by means of it with entire success a forward dislocation of the sternal end of the clavicle. The difficulty of retaining the bone in its natural position in these injuries, as is well known, is much greater than in cases of fracture, and in the one alluded to could not be done by Desault's apparatus, though several times, and very carefully applied. The lady to whom the accident occurred, wore the apparatus described for six weeks, and at no time suffered other inconvenience than that arising from confinement of the arm. The apparatus was contrived and introduced into the practice of the hospital in 1828, by Dr. Fox, then house surgeon, since which time it has been constantly employed.]

Fracture of the acromion process is occasionally met with: it is caused by direct violence. The breaking away of this process close to its root is marked by flattening of the shoulder; not to the extent, however, consequent upon luxation of the humerus, or fracture of the neck of the bone. There is always considerable bruising and bloody swelling, but that will not prevent the sensible signs of fracture from being discovered. The same means as recommended for fractured clavicle, and delineated p. 65, are here also employed with advantage. The spine and body of the bone are occasionally broken, but there is not much displacement. The chest is generally injured at

the same time, and one or more ribs perhaps broken. The same general and local treatment will suit both, viz., abstraction of blood according to circumstances, and the application of a broad roller and scapulary.

The articulating portion of the shoulder-blade occasionally suffers from blows, or falls, upon the head of the humerus. This latter bone more frequently suffers solution of continuity from such accidents, but it may remain entire, whilst the force communicated through it proves sufficient to injure the glenoid cavity. The neck of the scapula is rarely broken through, leaving the articulating surface entire; it is usually split up, starred, and comminuted. The consequences are an elongation of the extremity, marked flattening of the shoulder, prominence of the acromion, and loss of power in the upper arm, all somewhat attributable to the bruising of the muscles. General swelling speedily ensues, in some measure removing the flattened appearance. The limb can, under these circumstances, though with much pain to the patient, be put into any position; it may be applied close to the side, or raised up without the body of the scapula moving on the ribs, so that the humerus is brought at right angles to the chest. The elongation of the limb, and prominence of the acromion, can also be made to disappear readily, by placing the fingers of one hand in the armpit, and the palm of the other on the point of the elbow, and thus lifting up the extremity. Crepitation deep in the axilla will then generally be detected by the fingers, or by the ear placed on the shoulder; whilst it is plain that the continuity of the humerus is entire, by the motions of its head following those of the shaft, when slight rotation is attempted. The history, the mobility of the limb, and the crepitation, will decide the nature of the case; the treatment is the same as that already directed for fractured clavicle. If the part has been much examined and pulled about, and inflammatory swelling with great pain supervenes, warm fomentations may be assiduously resorted to, without undoing the pad or bandages. The fomentation is best made by bags filled with chamomile-flowers, hops, or bran, squeezed out of hot water, and applied at short intervals, for half an hour or an hour at a time. The reduction of

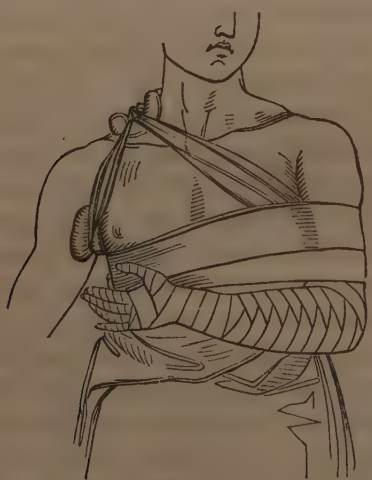
the fracture, securing and supporting the limb, as directed, will at once be attended with relief of all the symptoms, and will prove of itself the most powerful antiphlogistic measure. If that is attended to early, the necessity for general or local abstraction of blood may be dispensed with. But cases may arise requiring recourse to, and repetition of, both. The same remark applies to the next injuries to be considered.

Fracture of the coracoid process of the scapula may occasionally occur without injury of any of the surrounding bones; it is produced by some heavy body falling upon, or passing over the shoulder, as a cart-wheel. In such a case crepitation will be felt upon placing the hand on the shoulder, and making the patient breathe deeply. The humerus, clavicle, and scapula, being found uninjured, it will be concluded that the coracoid process of the scapula is fractured. Little treatment is required, except to keep the arm at rest, and constantly applied to the side.

Fracture of the head and neck of the humerus is by no means an unfrequent injury, and results from great violence applied directly to the bone. The humerus is broken pretty high, from force applied to its lower end, or by the action of its muscles. The fracture of the head and neck may, however, be set down as uniformly the consequence of immediate violence; consequently considerable bruising of the soft parts accompanies this injury, with great effusion of blood. The arm hangs powerless, the shoulder is flattened; the patient is sensible, on slight motion, of grating in the site of the injury; the extremity can be moved readily in any direction; in fact, the signs are the same as above detailed, as attendant upon injury of the glenoid cavity. The crepitation is here, however, more easily detected; and if the head of the bone is separated by transverse fracture from the shaft, below the tubercles, it can be felt in its place, uninfluenced by rotatory or other motions of the limb. Displacement of the head, with accompanying fracture, has occurred, but is, from the nature of things, most rare. The luxation must precede the fracture. For an account of the treatment, the reader is referred to the preceding observations. Perfect and immediate ease follows the adjustment of the axillary cushion.

If the fracture have occurred in the upper end of the bone, betwixt the insertions of the tendons of the latissimus dorsi, pectoralis major, and deltoid, then a leather splint may with advantage be applied from over the shoulder-joint to the point of the elbow. A piece of skirt-leather, (as it is called by saddlers,) dressed without oil, is cut so as to fit the limb; it is soaked and softened in warm water, and then applied and retained by a roller. It soon becomes a firm mould to the limb; it can then be stuffed with wadding, or lined with wash-leather, and thus forms an excellent support and protection to the injured part.

In all the injuries of the bones of the shoulder and upper arm, it is advisable, in the first instance, to give support to the lower portions of the limb, in order to prevent congestion in the vessels, and bloody or serous engorgement. This is almost certain to result to a painful and inconvenient degree,—if this precaution is neglected—from pressure by the pad on the veins in the axilla, and on the cephalic by the extensive ecchymosis,—and to such an extent as sometimes to render confinement to the recumbent position, a temporary removal of part of the retentive



apparatus, and recourse to local and constitutional antiphlogistic treatment, absolutely necessary.

The separate bandaging of the fingers, hand, and fore-arm, for this purpose, the position of the pads, the mode of fixing the shawl which contains the wedge-shaped axillary cushion, and the bandage surrounding the chest, are here exhibited. In bandaging the hand, a pad of lint is first placed on the palm, to fill up the hollow where the bandage would probably exert no pressure. A sling completes the apparatus for all the injuries of the clavicle and shoulder-joint here treated of, as well as for some others to be noticed in the next chapter.

A shortened, distorted, and bent appearance of the upper arm, with loss of power, following either an accidental application of great force to the limb, or powerful muscular exertion, will leave no doubt as to the os humeri having given way. The lower fragment is drawn inwards and backwards, and generally overlaps the upper. This bone is more frequently broken than any other, by the action of its own muscles; the osseous tissue may perhaps, in some of the cases, be in such a state as to give way under the application of but slight force. An opportunity of examining the bones in the following case occurred a few days ago.

Case.—Mrs. E., aged 49, was admitted into the North London Hospital under Mr. Liston's care, January 8, 1836, on account of simple fracture of the left humerus, which had taken place from the action of the muscles whilst turning in bed. She is in a state of great emaciation, and labours under carcinomatous tumour of various parts of the body; both mammæ, especially the left, are exceedingly hard, and fixed to the subjacent parts, and also to the integuments, which are tuberculated and discoloured. She has several tumours of the neck, and one especially very hard, under the left angle of the jaw. The poor woman has been bed-ridden for the last two years, on account of a painful affection of the lower part of the spine and right hip. Since then the catamenia have ceased. She left the hospital, in the end of March, with this bone quite straight and firmly united.

On the 4th of July she was again made a patient, along with a little girl, one of her children, on account of a fracture of the upper third of the right humerus, which occurred whilst she

was reaching out of bed, and trying, with a stick in her hand, to extinguish the flames which enveloped the child, her clothes having caught fire. In September she left the hospital, but to return on the 9th of March, 1837, with a second fracture of the left humerus, a little above its middle. This happened from the action of the muscles in cutting a slice of bread. On the 27th, on making some slight exertion to move, though placed from the first on a water-bed, she broke the right arm again, immediately above the insertion of the deltoid, and nearer the head of the humerus than the former fracture. Her strength gradually declined, and death terminated her manifold sufferings on the 22nd of April. (Abridged from the case-book of the hospital.)

The tumours described above were all carcinomatous, as were tubercles in the uterus and other internal organs. There was disease in the articulation of the body of the last lumbar vertebra with the sacrum, and of the right sacro-iliac synchondrosis; ulcerative absorption, but with only a small quantity of purulent secretion. I had expected to find the long bones full of oily matter, and their shells exceedingly thin, as in bed-ridden subjects; from their uniting readily, I did not suppose that any malignant disease had attacked the meditullium. The fractures, excepting the last, were firmly united, and the bones, contrary to all expectation, were ascertained, on a careful analysis by Dr. Davy, that most indefatigable and accomplished chemist, to contain, as seen below, a much greater quantity of earthy matter than in their normal condition.

Water . . .	6.2	Or without water.	
Phosphate of lime	61.5	Phosphate of lime	66
Animal matter .	32.3	Animal matter	34
	100.0		100

The fractures of the shaft of the humerus are sometimes oblique; they may be comminuted, and are occasionally attended with wound of the soft parts. Fracture of the lower or distal end of the bone is not unfrequently complicated with injury to the elbow. The condyles are separated by a longitudinal fissure extending into the joint, and considerable deformity

arises in consequence, from the effusion of blood into and around the capsule. By careful manipulation, and by attention to the motions of the articulation, the kind of injury will be ascertained. The general principles already laid down are to be followed out in the management of these as of other fractures; there will usually be no great difficulty experienced in the reduction. I met lately, in private practice, with rather a complicated case of fracture in this situation, and one not very manageable. The patient had been thrown out of a cab early in the forenoon, and pitched on his left elbow. Great swelling immediately formed, which had not been subdued—nor could that have been reasonably expected—by leeching or lotions, when I saw him late in the afternoon. There was great shortening and deformity of the limb in consequence of the displacement backwards of the condyles, which were broken off transversely from the shaft along with the bones of the fore-arm. The end of the humerus had been turned, as it were, upon itself, the broken surface resting upon the back of the shaft and pointing forwards. The ulna was also broken in its upper third. There were present the signs of luxation of the fore-arm, but with still greater distortion, and with great mobility; on handling the parts, crepitation was distinctly perceived. The reduction was accomplished readily by relaxing the triceps, and making extension and counter-extension.

If the fracture is compound, or much complicated, it may be proper to keep the patient in bed for a short time, until the violence of the symptoms has subsided, and the curative process is somewhat advanced. The fore-arm is bent at right angles, and the whole extremity supported on a pillow; then, by the application of pasteboard, or leather splints, cut out for the occasion, so as to fit the limb accurately, in the bent position, the bones will be kept straight and at rest. These splints should be long enough to embrace the joints above and below; they should not be so broad as to meet or overlap; they are softened by immersion in warm water, and when padded are applied, after coaptation has been effected, one on the outer and the other on the inner side of the limb. In cases of compound fracture, where it may be necessary to remove the outer splint from time to time,

the apparatus may be conveniently retained by the looped bandages.

[For the treatment of fractures of the neck of the humerus, the apparatus mentioned, consisting of the axillary cushion and sling, without the application of splints, is all that is necessary; but when the fracture is situated at the middle of the bone the application of these is required. Three pasteboard splints are commonly made use of—the outer extending from the top of the shoulder to the external condyle, the inner reaching from the axilla to just above the internal condyle, and the anterior one sufficiently long to reach to the bend of the arm. The roller is applied, as in all other cases, from the fingers up, and the fracture being reduced and the splints fixed as mentioned, is returned and fastened over them. The arm may then be bound to the body by a broad bandage, or can be left free, supported by a sling. In patients who are very restless, the roller soon becomes loose about the fore-arm and elbow, and necessitates a frequent re-application of it. To prevent, in a measure, this almost daily renewal, the use of an angular board splint well padded, and extending from the axilla to the hand, on the inside of the arm, may be substituted; one or more short splints being at the same time applied above the elbow. The fragments by this means are held perfectly in place, and the angular splint, by holding the fore-arm at rest, keeps the bandage well and evenly applied for a much longer period than is otherwise possible. During the cure, the angle of the splint should be occasionally changed, in order to prevent any degree of stiffness at the elbow. This mode of dressing is applicable to fractures below the insertion of the deltoid only; for fractures situated high up in the bone it would be manifestly improper.

For the treatment of fractures above the elbow the rectangular splints applied to the outer and inner sides of the arm are well adapted, but these should not only be long enough "to embrace the joints above and below," but in order to keep the parts at perfect rest, should extend from the upper part of the arm to the ends of the fingers. All fractures about the elbow are troublesome and serious accidents, and, without very particular attention is paid to their treatment, will be followed by deformity. To avoid this, the angles of the splints should be frequently changed, those first applied being removed after ten or twelve days and replaced by others of an obtuse angle.

For many years past fractures about the elbow have been treated at our hospital, by means of a single board splint applied to the front of the arm, with very satisfactory results. It should be of the width of the arm, well padded, and should extend from the axilla beyond the fingers. At first a nearly right

angled splint may be used, but at every dressing (and after the first few days they should be frequent,) it is to be changed for a more obtuse angled one, until finally the arm can be brought straight. The obtuse angled splints are then recommenced with and gradually replaced by others less obtuse, until the limb is again brought to a right angle. This plan carefully pursued, will generally prevent deformity, at the same time that it is of more easy application, and more effectually hinders the occurrence of anchylosis than the common mode of dressing.]

The wound will, of course, be first attended to. If very small and clean, it may close without the secretion of pus. In general, more or less discharge takes place; and it may appear some time after the accident, in consequence of the formation of abscess in the deep cellular tissue. It is seldom advisable to stitch wounds accompanying fractures: accidental wounds of considerable extent, as already remarked, rarely unite by the first intention. A bit of dry lint is laid over the opening; it becomes soaked with blood, dries and adheres, or the lint may be dipped in a mixture of white of egg and flour; this should not be interfered with, unless it appears that matter is confined. It may be necessary to enlarge the wound connected with fracture, so as to favor the reduction, when there is much displacement, and spasmodic action of the muscles. It may be advisable, with the same view, to remove with the saw, or cutting-pliers, the sharp end of bone; and both of these proceedings, in some cases, may with advantage be resorted to. Again, the surgeon may be called upon to enlarge the opening for the purpose of removing detached pieces of bone, either at the time of the accident, or during the progress of the cure: he may also have to enlarge the opening to permit the more free escape of purulent secretion, and for this purpose one or more dependent incisions may be required. All this must be left to the judgment and prudence of the practitioner in charge of the particular case.

There will be no occasion to confine the patient, who has suffered a simple fracture of the bones of the fore-arm, to the recumbent position. After bandaging the lower part of the limb, from the points of the fingers upwards to immediately below the injured parts, the splints are adjusted and retained by a simple roller. The limb is supported by a sling. The bandage can

readily be undone, if any occasion should arise to render this necessary. In fractures, scientifically treated from the first, swelling need not be dreaded to such an extent as to render it necessary to slacken the roller; after a few days it is undone and re-applied, so as to make the splints embrace the limb more closely.

[A number of examples have been presented to me of great suffering, in consequence of swelling following the application of a roller to recent fractures, even when scientifically applied, and in two instances I have witnessed mortification and loss of the limb follow it. A patient in robust health, and of temperate habits, was admitted into the Pennsylvania hospital on the evening of December 18th, twenty hours after the receipt of a simple fracture of the humerus, situated just above the condyles. He complained of great pain in the whole limb. The arm was enveloped in splints, and a well applied roller of the ordinary width, extending from the hand to the axilla, which were at once removed. The limb, which was excessively swollen, red, and very hot, was elevated, and evaporating lotions applied to it. By the following morning, gangrene of the hand and forearm had taken place. This extended up as high as the insertion of the deltoid, when a line of demarcation was formed, and the arm was successfully amputated. The second case was a compound fracture of the lower end of the radius, received at the hospital from the country in August, 1837, five days after the occurrence of the accident. A bandage, well applied, and splints extending from the palm of the hand to the elbow, had been put on within an hour after the injury. On removing them after admission, the soft parts around the fracture were found to have sloughed, an abscess extended up to the elbow joint, and sloughs existed over the condyles. Severe constitutional symptoms arose, making amputation of the arm necessary.

In fractures about the wrist joint, great tumefaction is particularly apt to occur; and I have seen so much suffering occasioned by the immediate application of a roller in these cases, that I am now in the habit of applying the splints for the first few days loosely to the arm, without the previous application of a bandage, and in all cases in which fractures of an extremity occur in the country, in such situations as will prevent it from being frequently visited, it is better to omit the application of a bandage directly to the part at the first dressings, and simply give support to the limb by long splints, well padded with cotton, attached to the member by means of a roller moderately tight.]

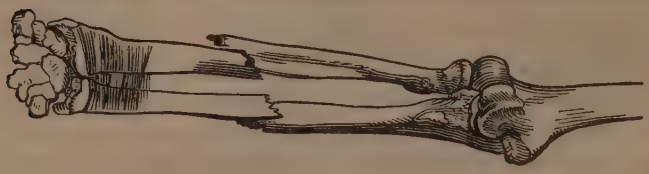
In using the splints of leather or pasteboard, it is advisable, in muscular subjects, to apply, outside of the bandage which retain these splints, one or more additional splints of firmer material; this is only a temporary and precautionary measure to prevent displacement of the apparatus by involuntary muscular movement, and these, with the roller which secured them, are removed in a few hours—so soon, in fact, as the permanent splints become dry and firm. A thin piece of deal, a piece of strong bookbinder's pasteboard, or millboard, not softened, or a slip of thin metal, will answer the end sufficiently, when the splints made of board, pasted on leather, are not at hand.

The olecranon process may be either struck off or pulled away from the shaft of the ulna, whilst the fore-arm is bent, by the forcible action of the triceps. The simple fracture unites readily by ligament, and the shorter this is, the more serviceable is the limb afterwards. The compound fracture is repaired with difficulty. In many cases, in spite of every care and attention, disease of the joint, and of the bones composing it, supervenes, and the failure of the patient's health demands the last alternative, amputation. This, however, is fortunately not a necessary consequence of division of the bone, the integuments over it, and the capsule of the joint. Some few patients are fortunate enough to get over the risks, and preserve the arm, when the division of the soft parts is inconsiderable. Every means should be taken to close the wound, at the same time maintaining the most perfect quiet, and relaxation of the triceps by position. In simple fracture the process is felt distinctly separated by a hollow space, and this space is increased by bending the fore-arm on the hu-

merus, as seen above. The extended position, so as to render the distance very short, is preserved by a hollow wooden splint on the fore-part, extending from above the middle of the upper arm to below the middle of the fore-arm; this is retained by the turns of a roller, applied without any degree of tightness, but made to cover the surface entirely. There is no purpose served by turning the bandage in the form of the figure of 8 round the joint behind, with the view of pressing the broken surfaces into contact; nor is any complicated apparatus, with straps and buckles, of the least use for this purpose. The surfaces effect immediate union slowly, if at all; temporary callus cannot be readily formed, and the growing together of the solution of continuity, otherwise, is but a slow process. It is not, besides, desirable to procure bony union, were it possible. A short ligament is stronger, and not so likely to be detached; and with it the limb becomes as serviceable as before the accident. The coronoid process is occasionally pulled or pushed off from the shaft, more especially in young subjects. I saw a case of it lately, in which the injury arose in consequence of the patient, a boy of eight years, having hung for a long time from the top of a high wall by one hand, afraid to drop down.

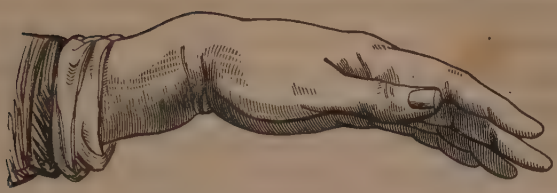
One or both bones of the fore-arm are often broken, and at various points. From falls on the palm the radius may give way close to the wrist, or this bone may break near its proximal end, and the ulna near the wrist. These bones are often bent in children by force so applied, or they are both bent and broken partially. The osseous shell, containing but little earthy matter, suffers solution of continuity on the convexity of its curve, and this is perceived readily by the crepitation produced when the parts are gently reduced to their normal shape and condition. Again, either bone or both may be broken transversely, in any part of their course, by a blow. The injury is generally detected without difficulty; but the fracture of the head of the radius is sometimes overlooked, and perhaps mistaken for luxation of the wrist, or mere sprain. A strict and searching examination must be instituted, whenever immediate deformity in this situation follows upon an accident. The loss of power and distortion when both bones are broken, or when

the shaft of even one has given way, will at once lead to the discovery of the seat and extent of the injury. If one remains entire, the ends of the other are drawn towards it by the action of the pronators, but there is, of course, no shortening; when both bones are broken, the inter-osseous space is diminished from the same cause.



As regards treatment, the limb is brought to its normal form by slight extension, and placed in a middle state betwixt pronation and supination,—at a right angle with the humerus, the most easy and convenient position,—and so secured by a couple of splints, which embrace the elbow, wrist, and fingers; these are fixed by the turns of a narrow roller. If there be difficulty in keeping the bones of the lower extremity of the fractured fore-arm from being drawn together by the action of the pronator quadratus, some pads of lint may be placed on either side between the bones, and firmly surrounded by the first roller.

Simple fracture of the lower part of the radius is caused usually by falls on the palm of the hands, and occurs frequently from half an inch to an inch from the distal extremity of that bone. This injury is sometimes mistaken, as already stated, for luxation of the wrist: though such displacement is of very rare occurrence. By strict examination the styloid process of the radius will be found in its natural situation, and the displacement will occur above the joint, an evident irregularity will be felt in this portion of the bone, and, by making pretty firm extension, at the same time rotating the limb, crepitation will be perceived. The accompanying sketch is very characteristic of the injury in question.



[Faults in diagnosis are very frequently committed in injuries about the wrist. Oblique fractures of the lower end of the radius are, in most instances, soon followed by great swelling and pain, which often prevents the detection of crepitus; and this symptom being absent, practitioners who are not in the habit of meeting with surgical cases, not unfrequently mistake these cases for sprains, and treat them by simply putting the part at rest, without the application of splints. An unsightly deformity, with a partial loss of power in the hand, are the consequences.

With us many practitioners are in the practice of treating fractures of the wrist with a single splint, but, in the majority of cases, this is not sufficient to procure a cure without deformity. Two splints should always be used; the inside one extending from the elbow beyond the ends of the fingers, while that on the outside should pass below the knuckles. In these as in all other cases in which a simple fracture communicates with, or is in the immediate neighborhood of the wrist or elbow joints, the dressings should be removed at the end of ten or twelve days, and after the joint is gently exercised, are to be re-applied. This should be repeated, at furthest, every second or third day. The same rule should be observed in all cases in which the fore-arm is confined in two long splints, as otherwise great rigidity of the wrist joint occurs, which is annoying to the patient, and requires a very long time for its disappearance.]

The fracture of the metacarpal bones and phalanges do not here demand much notice. When simple, they are to be managed secundum artem with narrow slips of wood, leather, or pasteboard; or they may be conveniently put up with thick lint, dipped in a strong solution of glue or gum acacia, or in white of eggs: this is covered with an additional layer of lint and a narrow bandage, the whole steadied provisionally by a small wooden splint. Too frequently the fracture is extensive, several fingers are smashed, the soft parts are lacerated, the bones

comminuted, and the joints opened; as by the explosion of gunpowder, or entanglement in machinery. Amputation is often demanded, but as little as possible of this useful member is to be taken away—the smallest part of it being of the utmost use; to preserve even one finger or part of it—the thumb more especially—is of the greatest consequence. The fore-finger, for instance, has been alone saved out of the general wreck; or the middle and little fingers, or the thumb and a mere stump of the middle one,—the proximal phalanx only,—and yet, after a time, the loss of the others has been much less felt than could be imagined, and the person—able to follow his employment, which the loss of the whole hand would have rendered impossible—has been most grateful for the considerate management of his case. An instance occurred to me lately, in which, from the bursting of a flask of gunpowder, the thumb was all but blown away; the articulation betwixt its metacarpal bone and the trapezium was quite open, and part of the former bone had been torn off. The head of the metacarpal bone was sawn off, and the part reduced; after a time, perfect and firm union took place, leaving little deformity and a tolerably useful hand. The upper extremity, it must be recollected, has greater power of recovery than the lower, and injuries of it are, besides, from its size and position, more manageable.

FRACTURES OF THE RIBS.

Fractures of the bones of the chest are not, unless the injury has been very extensive and many bones are involved, attended with permanent displacement. The integuments are sometimes divided, more frequently the internal investing membrane, and occasionally the contained organs. The signs of fracture of the ribs are sometimes detected with difficulty, especially so when one bone only is broken, at a point where it is thickly covered by muscles or fatty matter. The grating may be felt by the patient when he moves or coughs, and yet be with difficulty perceived by the surgeon. By making the patient take a full inspiration, then placing our hand firmly over the seat of injury, opposed by the other on the opposite side of the chest, crepitation may frequently be felt; or by the use of the stethoscope,

the patient taking as full inspiration as he can. If we suspect fracture near the angle of the ribs, we may sometimes in a thin subject discover crepitation, by taking hold of the ribs anteriorly, and attempting to remove them. The danger is considerable when great force has been applied, when several ribs have been driven in, and when the internal parts are consequently involved. Emphysema is the immediate consequence; effusion of blood, or bloody serum, may proceed to a prejudicial extent; and inflammatory action is to be dreaded. The bones are to be steadied, and the motions of the chest restrained by a broad bandage or belt passed round it; this is prevented from slipping down by the application of what is called a scapulary or split cloth, secured to the bandage behind: one end is passed over each shoulder, and fixed in front. If air has filled the cellular tissue of the neck to a troublesome degree, it can be allowed to escape by a few punctures made with the point of a lancet. Inflammatory action is to be guarded against, and combated if it arise, by venesection, to a sufficient extent—repeated, as circumstances may demand; by antimonials, aconite, and purgatives. At some period of the case, an opening into the cavity of the chest may require to be made, for the evacuation of purulent or other effusion. The necessity for this, as well as the mode of operating, will be considered in Chap. XIII.

The sternum is not so liable to be fractured as the ribs. This accident is generally produced by muscular action, resulting from falls, the back being struck, and the body suddenly bent backwards. Occasionally when persons fall from a height and alight on the head, the lower extremities being bent at the same time backwards, the sternum will give way; direct violence will occasion the most severe injuries of this bone. If the fibrous investment of the bone is not torn through, no displacement will take place: in more severe injuries, the lower fragment will be found slightly riding over the upper one opposite the third intercostal space. The treatment of this accident is similar to that recommended for fracture of the ribs. If much displacement occur, it may be necessary to keep the head somewhat bent back.

FRACTURES OF THE INFERIOR EXTREMITY.

Fractures of the thigh are perhaps the most difficult to manage, and bring to a satisfactory conclusion. The bone, throughout, is surrounded by large and powerful muscles; the upper part is so affected by the motion of the trunk and pelvis, that it is a troublesome task to keep the injured parts quiet, and in a favorable position for union. Besides, the thick covering, in the upper part of the limb, sometimes renders the diagnosis a matter of some difficulty.

Deformity and shortening of the lower extremity arise from various changes, sudden or gradual, in the relation or structure of parts about the hip-joint. On being called in to any case of the kind, a searching examination of the limb, and strict inquiry as to the history and previous condition, must be instantly instituted, in order to guard against error, and decide on the line of proceeding. The limb is shortened more or less in fracture of the upper part of the femur; at first, this may not be very perceptible, but it becomes gradually more and more apparent. The degree of shortening will depend upon the place and direction of the fracture, and the extent to which the immediate investments of the bone are torn. In fractures within the capsule, and when the fibrous envelope of the neck of the bone is not completely torn, there can be but slight displacement; and by the most attentive comparison of the two limbs, abbreviation of the one which has sustained the injury may not be detected. Osseous union may possibly take place; if it does not, then the neck of the bone will undergo alteration, and will be acted upon by the absorbents, so as to render the extremity an inch or more shortened. In all fractures completely within the capsule, the shortening is not at first great, perhaps not more than three-quarters of an inch, and it is necessary that the pelvis should be placed quite straight, and that a close comparison of the two limbs, of the ankles and knees, should be made, in order to ascertain exactly, how great the difference of length really is. A careful measurement should be made from the spine of the ilium to the malleolus.

In fractures partly within the joint, partly without, or in those passing altogether outside, through the trochanters, the diminution in length is more perceptible, and the signs of fracture more readily detected; the toes are everted in the majority of cases, in many they are inverted, and in some there is little or no deviation in either way. This last remark applies to all fractures about the hip, to those within as well as to those without the joint. The position would appear to depend upon chance in a great measure, and upon the way in which the limb has bent under the patient, or has been placed, on his being taken up. The position may be altered during the examination of the limb; at first it may be inverted, and afterwards, by the weight and inclination of the limb and foot, and by the action of the powerful rotators outwards, the toes may become everted. Fractures in this situation are almost uniformly the result of force applied directly to the trochanter major. Information that such accident has occurred, and that it has been immediately followed by loss of power, distortion and shortening of the limb, will lead to a suspicion of fracture, and to the institution of a proper manipulation of the limb to ascertain the fact. In some cases, any doubts are readily removed as to the nature of the injury that has been inflicted, on a previously sound limb, by an immediately perceptible shortening and marked eversion of the foot, following a fall on the hip. Fracture can alone account for these appearances. If inversion, however, exists, the difficulty of forming a diagnosis will be much greater.

It is to be kept in mind, that in all fractures there is no fixation of the limb; it can be moved in all directions; in fact, there is unnatural mobility, and, in the case under consideration, the limb can be extended very much farther than when the bone is sound. The object, in all these cases, will be to detect crepitation; and by slight extension and rotation, this is, in the majority of cases, easily effected. But difficulties do arise in ascertaining the existence of this sign; the bones are thickly covered—the tissues may be loaded with effused blood—inflammatory swelling may have been allowed to take place—the muscles may be rigidly and spasmodically contracted,—or the

neck of the femur may be driven into and wedged in the cancellated texture of the trochanter. In proportion to the difficulties of the case, so must be the anxiety and care of the surgeon in conducting his inquiries, and examination with the hand and ear; whilst the proper motions of the limb are made, grating will be perceived, and the diagnosis completed. The limb is shortened in consequence of displacement of the head of the bone from the cotyloid cavity; but the motions of the limb are abridged, and in the greater number of cases there is marked inversion of the foot. The appearance of the hip, the position of the trochanter and head of the bone, will lead to a proper understanding of the case, independently of any consideration of the mode in which the force has been applied. Eversion is often caused by mere bruising of the glutæi. The limb is also altered in form and length by disease of the articulation; and whilst this affection is in progress, an injury may be inflicted, leading to still further alteration in the form of the extremity; some of the signs of fracture or dislocation are thus presented. Or a limb, shortened by disease which has long ceased, may be subjected to accidental and violent contusion, and some of the signs of fracture may appear; there is marked shortening, and probably eversion; but the limb is wasted, and the shortening is not recent. These cases are not imaginary; they occur in practice, from time to time, and the surgeon must be always on the alert, careful in his inquiries, and prudent in the course he follows, otherwise he may commit serious and painful mistakes in treatment. Gradual shortening of the lower extremity often ensues upon contusion of the hip, in persons advanced in life, in consequence of interstitial absorption of the neck of the thigh-bone, and alteration of the angle in which it is set on to the shaft. The head of the bone undergoes a change of form; it becomes flattened and expanded, and the cotyloid cavity is made to correspond; deposites of dense osseous matter often take place around; the cartilage is sometimes in part absorbed, and replaced by a porcellanous polish of condensed osseous tissue. These pathological changes are not confined to the aged, as has been shown by my excellent friend, Mr. Gulliver. This cause of lameness must be kept in view; the risk of its occurrence

ought to be explained to those who have suffered injury of the hip; and, if possible, it must be prevented by treatment.

[Although the signs by which luxations and fractures of the thigh-bone may be distinguished from each other, and from simple contusion and diseases of this part, are dwelt upon in all treatises on surgery, and are made out to be readily distinguishable and well marked, yet all practical surgeons are aware of the difficulties of diagnosis sometimes attendant upon the various injuries about the hip, upon actual inspection. The true nature of the injury in these cases, is often more evident some hours or days after the receipt of the accident, than immediately after its occurrence, and I am inclined to think that the necessity of close *secondary* examinations, in all instances in which there is room for a doubt as to the nature of the injury, are not sufficiently insisted on. It is, however, more particularly where fracture may be *suspected*, that these repeated examinations are demanded, as from interlocking of the fragments, the limb may retain its natural length, crepitus may be absent, and the patient even be able to make use of it, and yet fracture be present. Sabatier has recorded an instance, in which the patient walked home, and even got up the next morning, after an injury of this kind. Desault states, that he has seen similar cases. Boyer saw a man who was able to walk with the aid of a stick during several days after a like accident. In the fourth volume of the Glasgow Journal, a case of injury of the hip is given, which had not confined the patient from her usual occupations, but which was proved, upon dissection, three months after, to be a case of fracture within the capsular ligament. Mr. Syme has also given an instance of fractured neck of the thigh, in which the patient walked some distance after it; and I have, myself, seen a patient, with a similar fracture, (proved by post mortem examination,) who assured me that he had walked some squares after the occurrence of his accident.]

Complete solution of continuity in the neck of the femur, in aged persons, cannot be expected to unite by bone. Independently of the diminished power of repairing any waste or damage, incident to the period of life, many general and local circumstances combine to render bony union very difficult and improbable. Old persons bear confinement in one position badly; with all attention, ulcerations and sloughing of the nates and back take place, the circulation being so weak that blood is not forced into parts even slightly compressed; it is not

easy to keep the broken surfaces in apposition for any lengthened period; union cannot be effected, for a time, as in other parts of this and other bones, by thickening of the surrounding tissues, and by deposite of new bone on the exterior of the old; the broken surfaces are besides bathed in synovial fluid, increased in quantity, and perhaps vitiated. The head of the bone is retained in its place by the round ligament; the surfaces of that and of the neck become smoothed and adapted to each other by frequent motion; and the trochanters are approximated to the border of the acetabulum, in consequence of the almost entire disappearance of the cercix femoris by absorption, as already noticed.

The capsular ligament is strengthened, and the solution of continuity is often replaced, by fibro-cartilage, or by strong ligamentous bands, as here represented. The female, from whom this specimen was obtained, suffered fracture, seven years previous to death, by falling down a flight of steps, striking the trochanter major with great force; this took place at the age of sixty-three: the changes in the form of the bone, and the nature of the injury, are well shown. This is the termination which it is generally desirable to promote. Great prostration of strength, and probably a fatal termination, are likely enough to follow long confinement of an aged person to bed, and very much to one position; and no good purpose, as has been shown, can result from such practice. Osseous union of the neck of the femur does, however, take place, though very rarely indeed; as when the separation has not been complete, the fibrous envelope remaining partially entire. But the natural cure, in those advanced in life, is by ligament; to favor this, to prevent inflammatory action running high, to avert the suffering and danger consequent upon it, and to render the patient as comfortable as possible under the circumstances, the injured parts must be kept for some time at rest, and in an easy position. The patient should be placed in

bed, (on one of those clumsy machines, called fracture-beds, if the practitioner and patient think it suitable and right,) and the knees bound together; or the legs may be bent and kept so, over pillows placed in the hams. A wooden frame covered with a cushion, and which can be raised or depressed at pleasure, and placed under the mattress—as used by my friend Sir R. Dobson, at Greenwich Hospital—is the most simple and efficient means of attaining the desired object, and is much superior to any other contrivance, in the way of fracture-bed or splint, which I have seen used in such cases. It is advisable, in order to prevent infiltration from pressure on the vessels in the ham, to bandage the feet previously, from the toes upwards. By interposing pads betwixt the ankles and knees, and securing them by the turns of a roller, perfect quietude of the part may be obtained even in the extended position. Fomentations should be assiduously made over the hip; and local abstraction of blood may be practised, if need be, according to the nature of the symptoms and the vigour of the patient. The confinement must be as short as possible: so soon as the painful feelings have abated, perhaps at the end of a few weeks, the patient must be encouraged to move a little on crutches, so that some use of the limb may be recovered. Fractures immediately outside the joint, through the trochanter, unite readily enough even in very old persons. It may not always be possible to decide exactly whether the joint is involved or not; but the greater degree of shortening and mobility of the limb, with the more distinct feeling of crepitation, will often enable the surgeon to distinguish the nature of the case, and to decide upon the practice. In all solutions of continuity of the femur in young subjects,—and in those apparently outside the joint, in patients advanced in life,—the object of the surgeon must be to replace the separated parts as nearly as possible, by undoing the eversion or inversion, as may be, and extending the limb to its natural length. It ought to be made to appear, after co-aptation, somewhat longer than the sound one, allowance being thus made for the stretching of the lower articulations. In this position it is to be preserved immoveably for at least six weeks, so as to afford every chance for union taking place.

The most effectual position, and, upon the whole, the least annoying to the patient, is that with the limb extended. By the use of a very simple, cheap, and easily-obtained apparatus, the retention can be fully accomplished much better than by the splints of Desault, Boyer, or Hagedorn. Certainly much better and more creditable cures can be thus made of all fractures of the thigh, than by any other position of the limb or trunk, by the use of any complicated and expensive machinery, or by any method supposed to be softer and more easy.

Some prejudice has always existed against the straight position of fractures, and it is said that certain muscles must act, so as to pull the ends asunder. In trying to humour one set of muscles, however, others are necessarily put upon the stretch and excited; whilst, in extension, it is found that all become quiet enough very shortly, and the ends of the bones fall into their natural position. No force is used in making or keeping up the extension, and by a comparison of the limbs it is in our power always to observe and correct any deviation in length or form.

The apparatus consists of a plain deal board, of a hand's-breadth for an adult, and sufficiently strong; narrower and slighter, of course, for young patients. It is made to suit the particular subject of the injury, to extend from opposite the nipple, to three, four, or five inches beyond the sole of the foot. It is perforated at the upper end by two large holes and provided with two deep notches at its other extremity; a sufficient hollow or perforation is made opposite the malleolus. A pad of corresponding length and breadth is attached by a few pieces of tape; a roller is split at the end, and having been tied through the openings in the top part of the splint, is unrolled so far, and fixed for the time to the lower end of the pad. The apparatus thus prepared for application is here represented.

Reduction having been effected by a little gentle and continued extension of the limb, while the pelvis is fixed, the position is

preserved by an assistant placing one hand over the dorsum of the foot, and the other upon the knee; a narrow roller is applied from the toes to a little below the site of the fracture, with a moderate degree of tightness, to prevent infiltration of the limb, in consequence of pressure by the perineal band, which is now placed under the patient; it consists of a large soft handkerchief or shawl, containing the necessary quantity of tow or wadding, and covered with oiled silk. The splint is then laid along the outside of the limb, and the roller, already spoken of and shown, is passed under the sole of the foot, and turned round the ankle and heel; these parts are previously thickly padded with tow, cotton wool, or wadding, to prevent the painful effects of pressure, as upon them the resistance to the extension principally falls. The roller is carried repeatedly through the notches in the end of the splint, as it is crossed over the dorsum of the foot, and ultimately turned round the limb to near the groin. The object in pursuing this plan must be apparent: by the attachment of the end of the roller and its subsequent arrangement, the apparatus is prevented from slipping upwards, and is made, as it were, of a piece with the limb. The ends of the perineal band are passed through the perforations, drawn with moderate tightness and firmly tied; and a few turns of a broad bandage round the pelvis and chest complete the proceeding.

The perineal band, by which the splint, and with it the limb, is pushed downwards, is attended to from day to day, and tightened as it becomes relaxed, in order to overcome any tendency to shortening. In consequence of the great length of the splint, the extension is made nearly in the direction of the bone, and is

generally borne without a murmur: in fact, patients who have been so unfortunate as to have submitted to treatment for fracture of the thigh more than once, and who have had tried upon them previously the bent position,—the leg and thigh being placed on a double-inclined plane, on a fracture-bed,—have in forcible language expressed their preference to the extended position, on the score of comfort.

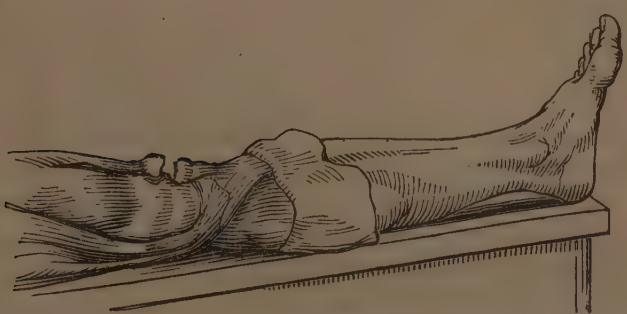
In those who have suffered fracture of the opposite thigh previously, and have recovered with a certain degree of shortening, it may be well to arrange so that the two limbs shall correspond as nearly as possible. By adopting the straight position in all fractures of the thigh, the surgeon has it fully in his power to preserve the limb of its original length and proper contour. Injury or disease of the ankle or of the perineum, which sometimes, though rarely, have occurred along with fractured thigh, will somewhat interfere with the proceeding recommended, as on these points the extension and counter-extension fall. If the injury is such that pressure cannot be borne in either of these situations, the surgeon must make the best of it he can, with the limb placed on the double-inclined plane—the apparatus recommended at p. 83—or Earle's fracture-bed may be employed; the leg-splint of M'Intyre, or that of Amesbury,—or the much more simple, though equally efficient one, represented at page 92, and now used for fractured leg at the North London and other Hospitals, with a sufficiently long thigh-piece,—may be applied with advantage, but with the prospect, whatever care be taken, of a certain degree of retraction and abbreviation of the member.

Fractures of the shaft of the femur are readily detected, and not to be mistaken; by the irregular and unrestrained action of certain muscles, the broken ends are drawn asunder and made to overlap. The upper portion is generally protruded forwards by the action of the psoas and iliacus, whilst the lower is drawn inwards and backwards by the adductors of the femur and flexors of the leg; the lower portion, besides, is turned outwards upon itself by the weight and inclination of the foot and limb, which cannot now be resisted by muscular action. Fracture of the lower portion is not unfrequently accompanied by a fissure

extending into the joint, and detaching one or other of the condyles; the outer condyle is occasionally broken off without transverse fracture.

Fracture of the thigh in the lower third may be treated by the bent position on a double-inclined plane, as already described, but with less comfort to the patient, and with the risk of his having a shortened limb. The straight position, maintained by the apparatus described and delineated p. 85, is to be preferred, in all the solutions of continuity, whether in the upper, middle, or lower thirds of the bone. Compound fractures of the thigh are treated in the same way as the simple, the bandage not being placed round the leg and splint opposite the seat of the wound, so that any dressing may be applied, or the state of the parts about the wound readily examined without disturbing the general apparatus. Compound fractures of this bone are frequently accompanied by so much laceration of the soft parts, and are usually caused by such severe violence, that amputation will be resorted to more often than in similar injuries of the other bones. When the fracture is situated low down, accompanied by splintering of the condyles, or wound of the joint, there will be little hope of saving the limb.

Fracture of the patella, like that of the olecranon process, differs in character, according as it is caused by sudden bending of the limb and action of the extensor muscles, or by injury from without. In the one case the fracture is transverse, and the separation generally very complete, the fibrous investment and periosteum being extensively torn.



In the other it is often found to be broken transversely, and at the same time longitudinally,—to be starred and comminuted; very frequently there is but slight displacement of the fragments. In all fractures of the patella there is a certain effusion of blood in the joint and surrounding cellular tissue greater in fracture from a blow, as is also the excited action which follows. Union of longitudinal fracture readily takes place by bone; as will also the transverse, following external injury, though slowly and with difficulty: it is a rare occurrence, and one not to be expected or favored. There is a specimen of bony union in my collection, obtained from a patient who fell from a great height and splintered the patella; inflammatory action had run high, and a small piece of bone had perished, whether from this cause or from the immediate effects of the injury, it is impossible now to say.

The ligamentous union is more rapid and firm: it is besides not so likely to be interrupted or dissolved. The shorter, however, the ligament, the more serviceable and strong will be the limb. The treatment consists merely in favoring by position the approximation of the upper to the lower fragment, which, of course, is not displaced. The limb is arranged, as represented in the last page, on an inclined plane, which comes half way under the thigh: to prevent accidental separation, as by the limb slipping off the tray on which it is placed, it is advisable to apply a wooden or pasteboard splint in the ham, extending from the middle of the thigh to the middle of the leg, hollowed out, fitted, and padded properly; this is retained by a roller from the toes to above the knee, covering the whole surface, but with no degree of tightness. The bandage is not to be drawn firmly in the form of the figure 8, over compresses of cork or other material, with the view to force the fragments into close contact, nor are any straps and buckles for the same purpose advisable—in short, there is no use for the complicated and useless machinery which is often employed. The roller is applied merely to fix the splint and secure a proper position, and this alone may be trusted to for the due approximation of the broken surfaces. Passive motion may be gradually employed, after six or eight weeks, along with frictions, douches, and other local tonics; occasionally, at an

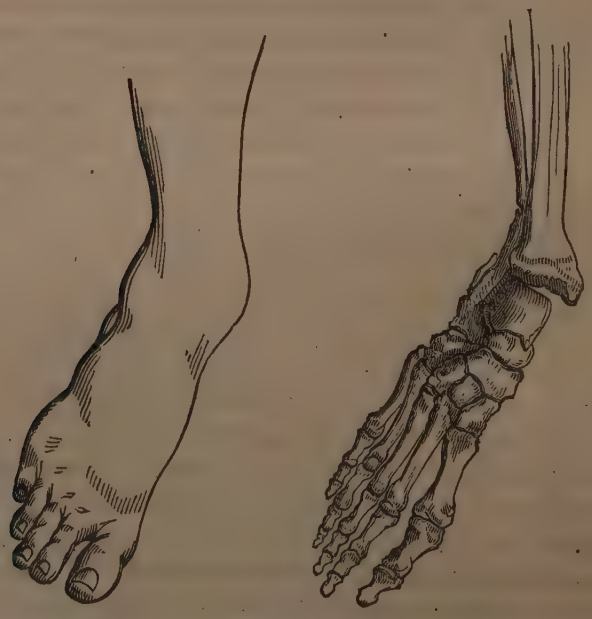
earlier period, in order to moderate excessive vascular action, fomentations and even local abstraction of blood may be required.

Fracture of the tibia and fibula is an exceedingly common injury, more especially in the labouring classes, and one which is very often badly managed, from want of proper apparatus, but the possession of a good set of splints is not all that is wanted; a surgeon must also have head to know how to employ them. A case came to my knowledge the other day, in which a fractured leg was laid in one of the new splints, without pad, bandage, or foot-sock to support the heel; the consequence was, that the foot, falling backwards through the aperture left for the purpose of obviating pressure, brought the back of the leg in contact with the edge of this opening, where it was allowed to rest until the tendo achillis was exposed by ulceration.

It is possible, by vast care and constant attention, to preserve the limb straight and of a proper length, by the use of very rude and clumsy contrivances, such as junks, or fracture-boxes. However, a cheap, and efficient splint,—on which a broken leg could be adjusted, and secured, during the time necessary for the completion of the process of union, and which would admit of removal of the bandages, for the purpose of attending to the state of the soft parts—has been long a desideratum. Many excellent splints have been contrived,—modifications of the fracture-box, and of the double-inclined plane,—such as the cradles of Assalini, Sir Charles Bell, M'Intyre, Amesbury, and Greenhow. These are, however, liable to many objections; they are clumsy and cumbrous, unnecessarily complicated, and expensive: all faults are, it is hoped, done away with in the machine now used in the North London Hospital, and which is coming into very general use both in public and private practice. Sets of these splints may be had of Messrs. Sheldrake and Bigg, Leicester Square, and of other instrument makers and cutlers, at a very moderate price.

But as regards the fractures; they are the result of force applied immediately to a part of the bone,—of sudden and rapid motion of the upper part of the member, the foot and lower part being arrested—or of force applied in the direction of the bones. One or both yield; the fracture is transverse or oblique, the two bones being broken at corresponding points; the tibia is broken, say in its middle, the fibula at two points towards its extremities,—a specimen of which, removed from a lad who met with compound fracture at sea, and presented by my friend, Mr. Busk, of the Hospital Ship, Greenwich, is represented on the preceding page; or the tibia is fractured near the ankle, whilst the fibula has separated close to the knee-joint, as happens when a person alights from a height on the sole of the foot, the muscles being prepared so, that neither inversion nor eversion takes place.

Fracture of the leg is sometimes much complicated by severe bruising and laceration of the soft parts, or by comminution of the bone: one or both bones may be thrust through the skin,

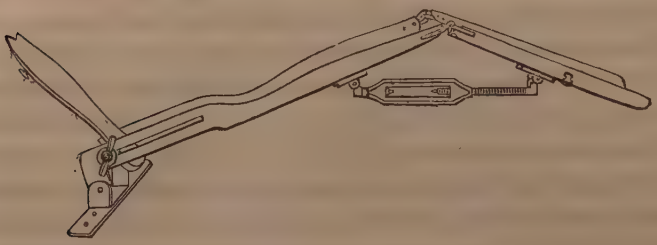


and sometimes the upper end is contused by coming in forcible contact with the ground. Attendant upon violent twisting and partial displacement of the foot, fracture of the lower end of the bones is often met with. As a consequence of eversion, the fibula is broken a short way above its articulation with the tibia, whilst at the same time the point of the inner malleolus may be detached along with the internal ligament, or the outer malleolus may be merely snapped short off. The history of the accident, if it can be obtained, the everted state of the foot, the inability to rest upon it, the effusion of blood in the sheaths of the flexor-tendons of the toes, the depression on the lower and outer part of the limb, will lead to a careful examination: and on replacing the foot, and pressing the fingers in the course of the fibula, looseness and crepitation may be perceived.

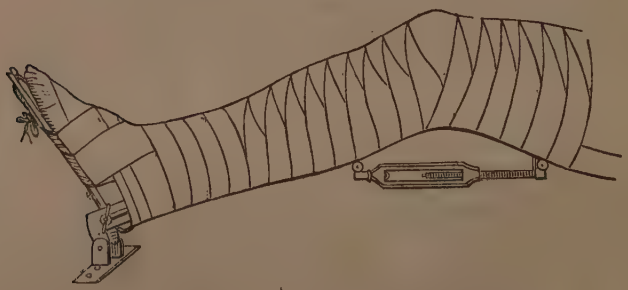
As a consequence of a twist of the foot inwards, the internal malleolus is snapped off, and sometimes a more extensive oblique fracture is occasioned, passing from the articular surface of the tibia, and detaching that process, as is here represented. At first, the nature of the injury is readily ascertained; but after inflammatory swelling has gained a head, very careful manipulation will be necessary to enable the surgeon to say whether fracture exists or not. In all injuries of this nature, a determined and attentive examination should be instituted at once, and thereby much pain and trouble will be saved. The necessity for all after handling of the parts is prevented, and a proper line of practice to forward the cure adopted from the first.

Fracture of the leg is to be immediately reduced: and the proper length of the limb having been ascertained by measuring the sound one from the bend of the knee to the heel, the simple splint spoken of above, and represented below, is adjusted accordingly: it, as well as the foot-board, is padded, and the pads

secured by a few bits of tape. The limb is raised, and placed on the apparatus; a sock, with a piece of tape attached oppo-



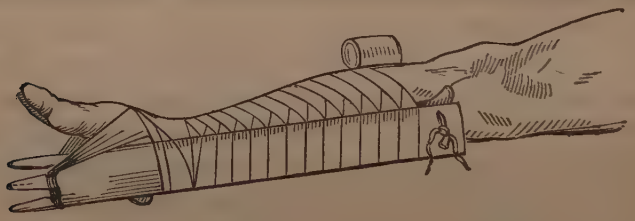
site the ball of the great toe, having been previously put upon the foot. This tape is turned over the foot-board, and fixed to the knob on its distal surface; the leg is put into proper shape, and the broken ends of the bones are ascertained to lie correctly, straight, and in perfect contact. They are so secured by a roller, which embraces the whole, and which is made to adapt itself neatly and accurately by reverses, where the swelling and inequalities of the limb would cause it to lie unevenly By passing the bandage, as here shown, under the screw, the



angle of the leg and thigh-pieces can be varied so as to allow the fragments to be adjusted perfectly, and the limb to lie comfortably for the patient. In all the fractures above the middle of the bones, the more nearly the limb is put straight, so as to relax the extensor muscles, the better will be the position of the ends of the bones in regard to each other; in fact, if the limb is bent, and the quadratus femoris and its tendon put upon the

stretch over the convexity of the articulation, the upper fragment of the bone will be made to project forwards: and if this is not attended to in time, and the position of the limb duly altered, the skin may give way by ulceration, and a simple fracture be thus converted into a compound one. And in most cases where there is difficulty in retaining the fractured ends in exact apposition, the straight position and greater elevation of the foot will be found most convenient. In all cases of fracture of the lower limbs, it is advisable, for reasons already given, to elevate the whole member, by placing the end of the splint on a stool or block of wood, or by slinging it from the ceiling or bed-frame. In a very short time from the infliction of the injury, and more especially if the fracture is simple, the patient may be allowed to get out of bed, the limb being so securely attached to the splint, and rendered so independent of the motions of the trunk, that no displacement can possibly occur. The cure thus goes on much more pleasantly and quickly, than when the patient is kept constantly recumbent, and he does not suffer in health from confinement. In about a fortnight after the receipt of the injury, or earlier, where there is very little inflammation or swelling, the fractured limb may be removed from the splint above described, and the starch bandage applied,—this consists of a roller round the limb well starched, then two pieces of brown paper cut in the form of side splints moistened in the starch, another roller which is covered with the starch, and lastly a dry bandage: this apparatus becomes dry in about twenty-four hours, is perfectly stiff and light, and permits the patient to go about upon crutches, having slung his leg from a bandage round the neck. It need seldom be renewed until the cure is completed. By turning the screw of the splint slightly from day to day, passive motion is given to the knee,—but not to any great extent, lest the ends of the bones should be disturbed, the motion of the splint not corresponding exactly with that of the articulation. This screw is no new addition to the splint; it was used many centuries ago, and is represented by Jerome of Brunswycke in his surgical works published in the beginning of the sixteenth century.

The fractures of the malleoli are conveniently and well managed, in the manner and by the simple apparatus recommended by the late celebrated Baron Dupuytren, somewhat modified. It consists of a short wooden splint, a diminutive of the thigh splint, perforated and split at the ends, and with pad and bandage similarly adjusted. It should extend from the head of the tibia or fibula, respectively, to three or four inches above the heel: the pad should be thick at the lower end, to avert undue pressure; or, by having it longer than the splint, the end may be doubled under, so as to effect the object. The apparatus is applied, as here represented, on the side of the limb opposite to



the fracture. In the case of fractured fibula, the foot is to be inclined somewhat inwards, over the fulcrum formed by the thick end of the pad, and by means of the turns of roller passed through the projecting end of the splint. The same apparatus is applied to the fibular side of the limb, for fracture of the lower end of the tibia with partial inversion of the foot. Fracture of one or more of the metatarsal bones is unattended by displacement, but cannot be inflicted without great contusion of the soft parts, and ecchymosis. Instant swelling ensues, at first soft, afterwards becoming hard and painful; the skin is discoloured, purple, blue, and green; the surface is sometimes abraded, and the true skin may even be torn. The elevated position on an inclined plane, made purposely for hospital practice, or on pillows in private, with assiduous fomentation and antiphlogistic treatment, and attention to the condition of the stomach and bowels, will bring about a cure. Mischievous effects arise in all bruises, whether complicated with fracture or not, from leeches, punctures, cold lotions, and stimulating frictions, employed in

the first instance. The blood effused into the cellular tissue cannot be evacuated by leeching, any more than can a coagulum, formed upon or in the substance of the brain, be got rid of by draining the system of the blood, as is too often done, by venesection, both in the public and private practice of many physicians. The blood is to a certainty made to putrefy, if air is admitted to it; the coagulum is dissolved, unhealthy suppuration is established, and the cellular tissue may slough together with the integument. Free incisions will then be required, in order to evacuate the offensive matter, and prevent extension of the mischief. At a later period, in a case of ecchymosis, means may be employed, though cautiously, to promote absorption of any coagulum that remains.

[At the Pennsylvania Hospital, the straight position is preferred in the treatment of most fractures of the thigh, and a modification of the apparatus of Desault, is that generally employed. The modification consists in the greater length of the outer splint, and the attachment to its lower end of a small block, over a notch in which the extending band passes, in order that the extension be made in a line with the axis of the limb. If the limb can be at once brought down to its natural length, it in all cases should be done on the first application of the apparatus; but when there is so much muscular contraction as to render this very painful, the limb need not be drawn to its full length at first. In these cases, it should be extended as much as possible, and at the second visit of the surgeon, should be seized at the ankle, and slowly pulled downwards, while an assistant tightens and makes fast the extending band. This course is to be repeated until the fragments are perfectly reduced, which may in most cases be readily done at the end of twelve or eighteen hours. No great advantage is believed to be gained by the employment of short splints, or bandages of any sort, applied immediately to the thigh, and their use is dispensed with, as they prevent the surgeon from accurately examining the state of the fracture, and require that the limb should be disturbed in order to re-apply them. A long narrow bag, stuffed pretty firmly with cotton, and covered with buckskin, is used for the counter-extending band, and a double buckskin gaiter, with a thin layer of carded cotton laid over it, or a buckskin band lined with linen, is made use of for the extension. Extension violent enough to cause pain should never be employed; it ought always to be moderate, steady, and permanent. If constant pain

is complained of at any point on which the dressings press, it should be immediately examined and re-adjusted. The restlessness of patients causes any apparatus to be easily displaced, and it is therefore necessary to smooth, tighten, and carefully re-examine it daily. Excoriation of the heel is most frequently produced by want of care in not having the extending band smoothly applied to the part, or by tightening it in too great a degree without having previously drawn down the limb with the hand. Sometimes, however, excoriation is caused by the weight of the foot alone; and in these cases, the application of a piece of kid, spread with soap cerate, will mostly prevent it. Great care is required on the part of the surgeon in attending to this fracture, whatever apparatus may be used. Under favorable circumstances, a shortening of the limb ought never to happen; and in order accurately to ascertain the length of the extremity, it is to be remembered that measurement must always be made from the anterior superior spinous process of the ilium to the malleolus.

In fractures of the femur within the capsular ligament, in patients advanced in life, the application of any splints in the treatment is discarded, the limb being merely supported by pillows in an extended and easy position.

In the treatment of fractures of the leg, as in those of the thigh, splints or bandages are rarely applied to the limb. The leg is placed in a fracture-box upon a well stuffed pillow, previously covered by a thin oil cloth, in such a manner as to bring the sole of the foot in contact with the foot-board. The fractured bones are then accurately adjusted, and the sides of the box are tied together moderately tight. The foot is securely fastened to the foot-board by means of a strip of bandage, in order to prevent its falling to either side, and the pressure of the pillow is, in the vast majority of cases, quite sufficient to retain the fragments in their natural position. The foot-board of the box is set into its bottom nearly straight, and is made to project beyond the foot, in order to prevent the toes from falling downwards, and thus cause a projection forwards of the upper end of the lower fragment.

Most fractures of the leg are followed by a good deal of inflammation, and measures should be taken ab initio to lessen its severity. These consist in the first instance in attention to position, elevating the fracture-box or foot of the bedstead, and afterwards in the application of cooling lotions to the limb. It is to prevent the pillow from becoming wet and unpleasant when the evaporating lotions are applied, that the oil cloth is placed above it. In order to obviate deformity in these fractures, when they occur at the lower part of the leg, it is highly important to keep the foot well forwards, and this is best done by placing under the heel some layers of carded cotton.

At the end of five or six weeks, the union is generally sufficiently firm to allow of the removal of the limb from the box, and a bandage and pasteboard splints, made to fit accurately the leg by previously soaking them in warm water, or the starched bandage, are applied to its sides. On these becoming hard, the patient is permitted to move about.

In fractures of the lower end of the fibula where the foot is much drawn outwards, the apparatus of Dupuytren is employed, but where, as is most generally the case, the tendency to a recurrence of the deformity is not in a great degree, the apparatus commonly made use of for other fractures of the leg, consisting of the fracture-box and pillow, so placed as to exert rather more pressure than usual upon the outer ankle, is resorted to.

In compound fractures of the leg, when not so severe as to call for amputation, the wound is carefully cleansed, and its sides accurately brought together with strips of adhesive plaster, and covered with lint, after which the limb is placed in a box and elevated, as in simple fractures, without bandages or short splints, and cooling applications made to it. If the wound unites by the first intention, which, however, is rare, the treatment is continued; and in cases where this does not happen, if the suppuration which follows is moderate in quantity, the same treatment is pursued with the addition of the warm water dressing, or of a poultice laid over the wound.

In these accidents, where the discharge of pus becomes profuse, or where hæmorrhage from the veins or small arteries, either primary or secondary, is troublesome, or is to be looked for, an excellent mode of treatment was introduced into the hospital many years since by Dr. J. R. Barton. It consists in fixing the limb in a good position in a fracture-box on a bed of dry bran, and surrounding and enveloping it with the same material. This application is soft and pleasant to the patient, makes moderate and very equable pressure, which is increased in proportion to the increase of the hæmorrhage by the bran becoming moistened and expanded, and is unirritating to the wound, at the same time that it may be removed with the aid of a spatula or syringe, and re-applied without causing pain or disturbing, in any degree, the limb. No mode of dressing that I have ever made use of can be compared to that with bran, in injuries of this kind attended with profuse suppuration, during our extreme hot weather. At this season, the fetor arising from the discharge is often so powerful as to taint a whole ward, and in such cases animalculæ are generated in the course of a few hours, if the wound be in the slightest degree exposed. Clean bran, by covering completely and closely every part of the injured surface, hinders the generation of these animals, and at the

same time prevents, in a great measure, the odour that would otherwise arise, by rapidly and effectually absorbing the discharge.

In hospital practice in this country, delirium tremens is often met with in connexion with fractured limbs, and is uniformily attended with much danger to the patient. In these cases, it usually shows itself during the first thirty-six hours after the accident, and from the period of its setting in, where at all severe, little or nothing can be done in the way of treatment for the fracture. We have found the best method of managing a simple fracture of the leg or arm, during an attack, to be to remove all dressings from the limb, and envelope it in a pillow. This should be large and well stuffed, and should be bound tightly around the limb by means of a roller. The elasticity of the feathers is such, that no danger of making too much pressure on the part need be entertained, and it will be found to hinder all motion, and keep the fragments in apposition better than any more complicated apparatus.]

DISUNITED FRACTURE.

Union of broken bones takes place very slowly under some circumstances, and may altogether fail. This depends upon constitutional or local causes, or upon an indifferent, careless, or meddlesome treatment. The broken ends may be separated from each other, and rounded off; they may be in contact, and surrounded by a cyst formed by condensation of the cellular tissue; or they may overlap considerably, and lie side by side, either in close apposition, or with some substance interposed.

Various means have been resorted to with a view to set up a process by which consolidation may be brought about. In recent cases the object may be attained by changing the position of the limb if necessary, and taking great pains to prevent the least movement of the parts, retaining them in very close and accurate contact by means of splints and bandages. But it is generally necessary to take means previously to promote a certain degree of action. With this view, the ends of the bones have been moved about, and rubbed against each other. Incisions have been made, escharotics applied, and portions of the bone have been sawn off in many cases, without much benefit accruing. The chance of success depends greatly upon the relative position of the ends. If they overlap, and are in con-

tact, as frequently happens, the case may be looked upon as favorable. Vascular action in the membrane of the bone can be roused, and the best means of doing so is by the introduction of a perforator followed by a strong needle, with an eye near its point, by which a coarse seton is passed between the two portions. Of course an opening will be made with a bistoury in the soft parts, close to the bone,—taking care to avoid vessels, nerves, or other organs of importance,—before the introduction of instruments to disturb and lacerate the deep parts. If the bones do not overlap, it will be advisable to make an attempt to put them in that position; a short and firm limb being more serviceable than one that dangles about, weak and unsupported by the muscles. This practice has succeeded in the leg, thigh, fore-arm, humerus, which last, by the way, is the bone most frequently the seat of false joint. I have had several cases in which the treatment by seton has been followed by a perfectly successful result in these bones; I have also, as might be expected, had one or two failures, and have besides declined interfering in several instances, on account of the unfavorable circumstances dependent upon them. The plan I have pursued has been to pull about the parts a good deal at first, to introduce a larger and larger cord, and to remove the foreign body at the end of a few days,—eight or ten,—so soon, in fact, as a considerable degree of excited action has arisen in the bone and periosteum, and before it has begun to decline; the limb is then put up with great care, and every chance of the slightest motion guarded against. The object in passing a seton is assuredly not to promote and maintain discharge, which is prejudicial to, and which, when the result of accident, often enough interferes with the union, and gives rise to the necessity for such operations as that now under consideration. This error in judgment and practice seems to have been committed very frequently, as may be seen by a reference to published cases. The following narrative is interesting, and very much to the point under consideration.

Mrs. T., aged 48, presented herself lately at the North London Hospital for advice, and stated that having been thrown off a carriage in October 1833, she received a compound frac-

ture of the left humerus about its middle, and was immediately carried to an hospital. She remained an in-patient only three weeks, having been made an out-patient by the house-surgeon during the absence of his principal from town, at which the latter gentleman was very angry on his return, and to which, more than to anything besides, she attributes the non-union of the fracture.

She continued to visit the hospital, as an out-patient, frequently during six or seven months; and the external wound having healed, it was found that the bones had not united. She afterwards became an in-patient, and had the tincture of iodine applied around the upper arm. Her health began to decline, and she went into the country.

She returned to town, having regained her strength, and in October 1834 (twelve months after the accident) underwent the operation of removing the ends of the bones by the saw; she was kept strictly quiet in bed for five or six weeks, when the arm was examined, and the bones found still disunited. She subsequently had inflammation within the chest, and was put under the care of one of the physicians. She recovered from this attack, but remained in the hospital; in April 1835, the ends of the bones were "nipped off," and a seton, consisting of a skein of silk, was introduced, and allowed to remain thirteen months, the silk being changed only once during that period. An apparatus was contrived, by which the fore and upper arms were retained at a right angle to each other; the ends of the bones were kept in apposition by means of leathern bands passing from the shoulder to the elbow, and the upper arm was attached to the side by other bands passing from it to the opposite shoulder, a space being left sufficient to permit the dressing of the sore.

In June last (1836) the seton was taken out, and she was recommended to go to Brighton for her health.

Having returned to the same hospital ten weeks since, she stated that she was then told that her arm had better be taken off, and that nothing else could be done for her. She was unwilling to submit to amputation, and left three weeks ago. The arm was quite loose, the muscles wasted, and the bones far re-

moved from each other. Under the circumstances, any further attempt to force a union was out of the question. An apparatus was fitted round the pelvis, in which the fore-arm rested, so as to enable the poor woman to use her hand.

[The few pages devoted to the consideration of disunited fractures in our treatises on surgery, are for the most part extremely vague and unsatisfactory, and in practice, the various modes of treatment recommended for their cure, are resorted to without discrimination, according to the particular fancy of the practitioner. Among the constitutional causes which may give rise to this state of parts are, syphilis, pregnancy and suckling, cancer, advanced age, improper abstinence from food or the withdrawal of an accustomed stimulus, scurvy, fevers of a low type, or any other disease inducing great debility, or actual prostration. The most common local causes are, too wide a separation of the fractured extremities, necrosis or other disease of the ends of the bone, tight bandaging, and the too early use of the fractured limb. Want of perfect rest from careless and meddlesome treatment, is generally set down as a principal cause of defective union after fracture, and no doubt does give rise to it in some instances, though not, I believe, to the extent generally admitted. Indeed, non-union occurs sufficiently often after the most regular treatment, to make us cautious in ever attributing this state to any fault of the surgeon. In bad compound fractures, the large discharge of matter from the wound not unfrequently requires that the limb be daily moved, and the fragments are consequently much oftener disturbed than occurs in the treatment of simple fracture, and yet false joint is not as frequent in the former as the latter class of cases. How often do we see cases that have been carelessly treated, or even entirely neglected, where union, though attended with deformity, takes place? How often where two bones existing in the same limb have been fractured, do we find that one will unite and the other not? How many cases too, have been observed, where more than one fracture has existed in the same individual at the same period, and where, though all be equally well treated, want of union will follow some one of them? If non-union depended generally upon want of perfect rest in the injured part, the bones that are with most difficulty retained in apposition after fracture, are those in which we should expect most frequently to meet with it. The clavicle, comparatively speaking, is rarely the seat of un-united fracture, and yet did it depend upon mobility, that bone of all others, is the one which we should find most frequently affected with it. The ribs we daily see well united after fracture, despite the constant motion to which they

are subjected in respiration. Causes may be suggested to account for non-union, some of which may seem plausible, or be shown to be true with regard to particular instances, but in many cases its occurrence cannot be satisfactorily accounted for. That the state of the constitution has considerable influence over the process of reparation in fractured bones, none can deny. Where the lancet has been largely used after the accident, where patients are much debilitated, or are labouring under constitutional diseases, the process may be retarded, but where the peculiarity of constitution which hinders consolidation of fractures does not exist, we find generally the deposite of callus to take place, upon this morbid state of system being removed. Even after a fractured limb has become perfectly firm, and is surrounded by a large mass of callus, it is possible for it to become softened, or entirely absorbed. I have in two or three instances, witnessed the first of these effects produced by attacks of erysipelas in compound fracture, when this disease has prevailed generally in the wards of the Pennsylvania Hospital; and in one instance of simple fracture, have seen a rapid absorption of a large callus, which had produced firm union of a fracture of the lower third of the leg, occur without any apparent cause, to such an extent as to render the fragments very moveable, and necessitate a renewal of the treatment.

Disunited fractures are sometimes met with which occasion so little inconvenience as scarcely to interfere with the use of the parts in which they may be situated, and under such circumstances, it is questionable whether the trial of any operative means should be recommended for their cure. Two instances of this kind have come under my notice; the first was an ununited fracture of the clavicle, in which, although great motion existed between the fragments, so little inconvenience was experienced that it was not judged proper to resort to any treatment for it; and the second was a case of false joint in the radius, two and a half inches above the wrist, where the patient enjoyed excellent use of the member, and notwithstanding some deformity, was able to work at his trade (that of a tailor,) as well as if no accident had happened.

Even in cases where want of bony union after fracture has not permitted the patient to make use of the limb, we often find that by the employment of simple means, as a leather, tin, or pasteboard case, the defect may be rendered very supportable. In the majority of instances, however, the extremities affected by pseudarthrosis become almost useless, and resort to operative means is demanded by the patient. In the treatment, no exclusive method should be adopted, and in deciding upon the plan to be pursued, we should be governed by the situation of the injury, whether near a joint or otherwise, the limb affected, the

length of time which the fracture has existed, the degree of mobility existing in the fragments, and whether they are in apposition or otherwise. A work like the present does not admit of our entering into a consideration of all these states, but the practice generally to be pursued, may be concisely summed up as follows.*

1st. To apply the method of cure by rest and compression. If the fracture has been regularly treated, and is not consolidated at the usual period, replace the limb in the apparatus and insure to it a state of complete immoveability: if the treatment of the injury has been altogether neglected, or been inefficient, apply proper splints and moderate compression with a roller, and renew these as soon as they become in any degree lax.

2d. If from want of action in the seat of injury, rest and compression are in themselves insufficient to produce a cure, continue the state of immoveability in which you have placed the limb, and apply blisters, moxas, or some other stimulant to the seat of fracture.

3d. If both of these modes fail in producing a deposition of callus, employ frictions.

4th. If the methods mentioned fail to produce a change, or the patient has already been suffering from his injury for eight or ten months, and there is no contra-indication to it, resort to the seton.

5th. If the case be one to which, from its long standing, or state of the injured parts, the seton is inapplicable, expose the fracture, and apply caustic potash to the fractured ends.

6th. If all of the above means have been carefully resorted to unsuccessfully, and not till then, resect the ends of the bone.

In employing any of the above means, any obstacle to the occurrence of union which may exist, arising from the state of the constitution, should be carefully sought for, and combated, by an appropriate treatment.]

DISEASES OF BONES.

As the result of deposite of tubercular matter in the cancellated texture,—or of slow, and what is denominated scrofulous inflammation and suppuration,—ulcerated cavities are formed in the heads of long, and in the substance of short, bones. Occasionally, though more rarely, the flat bones are similarly affected by an ulcerative process. Abscesses are sometimes

* The subject of Disunited Fractures will be found fully treated of, in a memoir which I published in the American Journal of the Medical Sciences, for January, 1842.

also met with in the canals of long bones. Some make rapid progress: additional deposite takes place of osseous matter around the cavity, the periosteum becomes more vascular and thick, and even the neighbouring tissues are infiltrated and altered in appearance. Other accumulations are more indolent; the parieties of such abscesses, or spinæ ventosæ, as they were absurdly enough termed, expand gradually, and demand surgical interference, more on account of the deformity and lameness attendant upon them, than for constitutional disturbance or painful sensations. Abscesses in bones, whether acute or chronic, discharge themselves externally through openings leading from the bone through the condensed cellular tissue and integument covering them, after a short time they become rounded off, and form cloacæ and papillæ, as they are termed; or, again, the matter finds its way into a joint, and by its presence involves and destroys the cartilages, synovial membrane, and fibrous tissues around.

The anatomical characters and chemical changes, the lardaceous deposite in the recent cavity, the dried porous appearance of the macerated and prepared bone, the conversion of the animal substance into a greasy, fatty matter, must be considered elsewhere. The surgeon will sometimes be called upon to open abscess of bone, by division of the superimposed parts; or even after matter has found its way to the surface, and discharge has been furnished, it may be found necessary to give it a freer exit, so as to prevent accumulation; thus affording a chance of the secretion being gradually diminished, and ultimately arrested by obliteration of the abnormal cavity. This is effected readily enough in some exposed bones, as the tibia, the lower end of the fibula, the great trochanter, and the ulna; the soft parts are divided by means of a strong-pointed bistoury, and the exposed layer of bone is removed by the application of the crown of a trephine, of a large or small size, as may be. By the use of a trois quart of proper dimensions, a cloaca, if such exist, may sometimes be sufficiently enlarged, to allow of the object in view being effected. The unhealthy surface of the cavity may be thus removed, or escharotic or other applications made, if it be thought that advantage will arise from the prac-

'tice. In the cavities of abscesses in the cancellated texture, and sometimes in the shafts of bones, dead fragments, detached or not, are frequently discovered. These may be either the consequence or the cause of the abscesses, and their removal is sometimes attended with good effects. This is easily accomplished after the external opening has been made sufficiently large, by the introduction and judicious employment of a small scoop, or of forceps suited to the purpose.

Cavities in bones, lined by secreting membrane, are much slower of contracting and healing than similar cavities in soft parts. The tissue is endowed with a less degree of vitality or power of reparation, and besides, the elasticity is wanted by which the walls of abscesses in soft parts come together and are closed. I have repeatedly had occasion to trephine the tibia to evacuate matter, or to remove small internal sequestra; and the other day I put my hands on an old note-book, containing a case in which this operation had been performed on the heads of both tibia and fibula of the same patient, in the year 1822, with a successful result. A case in which a very successful operation was performed for evacuation of matter from the medullary canal of the tibia, at the North London Hospital, will be found in the Lancet for 1837–38. The perforation was made through bone condensed and thickened to an extraordinary degree. I have also been obliged, in some few instances, to apply the trephine to the femur at various points; and there is a case now under my care (June 1837) in the North London Hospital, in which an abscess on the outer and inferior part of this bone was opened freely by this means, and a small sequestrum of the cancellated texture removed. The young man had been my patient, three or four years previously, in the Edinburgh Hospital, and then had presented himself with the view of submitting to amputation of the thigh. A very large sequestrum was on that occasion removed, comprising more than half the thickness of the shaft. He made a perfect recovery, and had remained well, and able to earn his livelihood, until within a few days before his admission to the North London Hospital; a large abscess was then approaching the surface, anterior to the outer hamstring; it was opened, and a

quantity of most offensive pus evacuated: it was then ascertained, by the introduction of the finger, that the bone, as suspected, was diseased. Some time afterwards, when the tenderness had subsided, an examination was made by a probe. From the possibility of passing the instrument on each side of bare and dead bone, it was supposed, both by myself and my then house-surgeon, Mr. Watts, that there was a considerable portion partially separated. We were both deceived, however; for, on cutting open the soft parts pretty freely, it was soon found that there was merely a cloaca in the shaft, the edge of which was uncovered, and in a state of necrosis, but still attached; the crown of the trephine was applied to this, and the opening having been sufficiently enlarged, a small portion of dead cancellated texture, probably the cause of the mischief latterly, with some trouble was extracted. A curious feature in this case was shortening of the femur, and consequently of the limb, to the extent of nearly three inches; and this certainly without disease of the hip-joint or any fracture of the substitute bone, if dependence is to be placed on a very accurate history.

Removal of the extremities of bones affected by caries originating in diseased action either of their own tissue or of that of the articulating apparatus, remains to be considered in the next chapter.

Acute inflammation of bone is often followed by formation of matter on its surface, and under the periosteum; and this is sometimes connected with loss of vitality of the external lamellæ; or death of a great portion of bone may occur—the whole thickness of a flat bone to some extent, or the greater part of the shaft of a long bone—as the effect of inflammatory action, the result of injury, or the consequence of some vice in the system. Death of a portion of long bone is not quite so rapid a process as is generally supposed; it is preceded and accompanied by the deposite of new matter on its surface, and under the periosteum, which soon becomes osseous. The intimate structure of the original bone which remains alive, is swollen out and condensed by interstitial deposite; whilst the dead portion—exfoliation, or sequestrum—is generally separated from the living by ulcerative

absorption; and hence the worm-eaten appearance that sequestra generally present. Purulent matter is secreted, and finds its way to the surface through the external shell, made up of old and new bone; and part of this shell is removed, as the dead bone becomes loose, thus allowing it to reach the surface and be thrown out. This process is occasionally retarded by local circumstances—for instance, the great size and position of the sequestrum; or it may be very slow, in consequence of the power of the patient's system having been weakened by long-continued irritation and discharge.

The surgeon is called upon to interfere and assist nature in all stages of the disease. By active management the inflammation may be arrested, and abscess or necrosis either prevented or limited. Great and instant relief may be afforded, and the extension of mischief guarded against, by a timely and free incision, as is seen in the more severe forms of paronychia, whether the bone has been primarily affected or not; and in an advanced period of the case, the removal of decayed parts, the presence of which always occasions great disturbance, may be effected with advantage. Interference is only admissible, however, when the exfoliation or sequestrum is completely detached by the natural processes. The dead portion of bone may be confined and retained by the soft coverings only, as in the two following cases, to which many more very similar might be added.

Case I.—An old lady came under treatment on account of disease of the cranial bones, accompanied by very profuse and fœtid discharge. Her health was very much broken, in consequence of the long-continued drain on her system. By introducing a probe through the numerous openings, the frontal and parietal bones were found to be detached from their investing membrane, rough on the surface, and dead. This state of matters was attributed to external injury, the old lady having had the misfortune, on two or three different occasions, to be pitched on her head by the upsetting of carriages; she had suffered, in consequence, under inflammation of the coverings of the cranium, the symptoms of which had been combated by repeated courses of mercury; and as a result of the local injuries

and the treatment, most extensive death of bone, with shattered constitution had ensued. The left half of the frontal bone was exposed, by laying two or three of the openings into one, and the slightest possible motion could be perceived on placing an elevator in one of the irregular hollows on the surface, and pushing with it firmly; still the exfoliation, though, to all appearance, completely unconnected with the living parts, remained firmly seated. It was of such a size, that without most extensive division of the scalp, its edges could not be exposed, nor could any instrument be insinuated in the line of separation for the purpose of raising it; in fact, it was held on by atmospheric pressure. Satisfied, from the state of the bone, its slight mobility, and the duration of the disease, that such was the case,—a screw attached to an old-fashioned perforator, which had been found useful in similar cases, was fixed firmly into the substance of the exfoliation; by pulling it up to a side, one of the edges was detached, and the extraction accomplished without difficulty, and with but trifling pain. The cavity in which this immense exfoliation lay has been filled up by membrane, the discharge has abated much in quantity, loose portions of the parietal bones, and of the other side of the frontal, have been removed, but some very large pieces still remain to be separated.

Case II.—A young gentleman of nineteen was presented to me, on account of profuse discharge from an opening in the middle of the right popliteal space, which had continued more or less between five or six years. His health was bad, and he was of small stature, thin, wan, and wrinkled, as if his growth had been stunted. By careful examination with a probe, a large piece of dead bone was discovered; this had been suspected long before application was made to me, but it was anxiously though vainly enough hoped that the sequestrum would be removed by absorption; attempts had been made to promote this supernatural process; and with that view, I presume, the part had been from time to time wrapped up most sedulously in plaster, after the skin had been covered by a filthy, deobstruent ointment,—during a space of nearly two years.

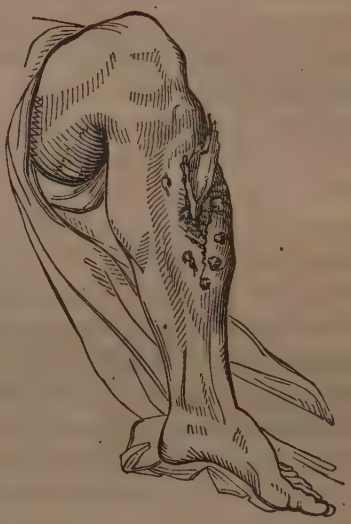
The absurdity of waiting for such a hopeless interposition was pointed out, and the extraction proposed and urged; three

or four months elapsed, however, and at length consent was given to the operation. The opening in the ham could not with safety be enlarged: the popliteal space was filled up by infiltration of the cellular tissue, and it would have puzzled any one to say on which side of the opening the nerve, vein, and artery lay.

This, by the way, is no uncommon seat of necrosis. The sequestrum is generally thin, and composed of the outer lamellæ of the flat part of the bone, on which the vessels rest. The bone is here not exposed to injury from without, and is, moreover, well covered and protected by soft parts. Death of bone, therefore, is in this situation most probably a secondary affection, the consequence of abscess in that mass of fatty matter interposed betwixt the vessels and bone. It is rather a troublesome situation to remove foreign bodies from, the space being limited, and containing important parts. In many cases I have succeeded by enlargement of the original wound, when that has been placed near the one or the other hamstring, and when the sequestrum has been small. In effecting the extraction in a variety of others, the practice pursued in the case at present under notice has been advantageously followed.

The sequestrum was ascertained to be large, and the cavity, in which it lay, capacious. The point of a strong probe, bent and introduced in the ham, could be felt, through great thickness of parts, on the outside of the limb; an incision was here made betwixt the outer hamstring and the femur, the cavity opened, and the dead bone extracted. Six months after, the patient was again brought for advice, much altered for the better, strong, ruddy, and full of flesh; the opening through which the sequestrum was withdrawn, had healed very quickly; the original opening had also dried up for a time, but latterly it had begun to pour out a little discharge. The existence of a small additional portion of loose bone had been detected by a gentleman in the country, who had paid great attention to the case; with some difficulty a piece about an inch long, ragged and pointed, was seized with a pair of slender bent forceps, and extracted; immediately after this, the opening healed up firmly, the cicatrix becoming retracted and permanent.

In cases in which the dead bone has approached the surface, it can be reached, seized, and extracted, by mere division of the soft parts. Cases now and then occur, where, by the ulceration of the soft parts, one end of the bone is exposed,—as represented in the second of the accompanying sketches,—so that it can be laid hold of and extracted in the direction of the shaft, and almost without the use of instruments.



These are sketches from the same case, at different periods, in a lad of seventeen. In the state represented in the first, the existence and the detachment of the sequestrum were ascertained, and, by no very severe proceeding, the dead portion could have been exposed, and readily and safely removed; the patient, had he consented, would have been thus saved much pain and long confinement, and the cure would have been abridged by nearly one year; nature having taken that time to accomplish what might have been effected in a very few minutes.

Occasionally when a cloaca is exposed by ulceration or incision, the cavity with which it communicates is found to con-

tain a dead portion of the shaft, which may be made to move readily backwards and forwards; the middle of this sequestrum can be got at, but the ends cannot possibly be reached or disentangled. In such a case, more extensive opening of the shell may be resorted to; it may be practicable to gain sufficient room, by dividing the interspace of two or several openings in the new envelope of bone, and, this is done readily by the use of a small saw or cutting forceps; or, in order to uncover sufficiently the part to be removed, it may be found necessary to make a perforation or two with a trephine, converting these and the cloaca into one ample opening. Though neither end is fully uncovered, disentanglement may often be achieved by first pushing the sequestrum either downwards or upwards, in its containing cavity. In other instances,—as when nearly the whole thickness of the shaft of a bone has perished to some extent, the substitute bone is imperfect, the middle of the dead portion is fully exposed, and its ends are confined,—division of the sequestrum may be performed without pain, and the two portions extracted separately, with ease. Care must be taken, in the removal of the dead bone, not to break up the shell too much which contains it, so as to endanger complete solution of continuity. The instruments for these operations must be well contrived, and efficient in every way as regards their size, strength, and temper. Trephines, Hey's and other small saws, may be required; cutting-pliers, elevators, sequestra-forceps, and strong bistouries, complete the apparatus.

The vessels bleed freely, because the condensed state of the cellular tissue prevents their retraction. Ligatures will seldom be necessary for any of them, the same condensed and firm state of parts being favorable for the application of pressure. After complete removal of the blood, the cavity is well filled with lint; this is retained, and the pressure, if necessary, kept up for some hours by a compress and roller.

CHAPTER IV.

ON INJURIES AND DISEASES OF JOINTS.

SPRAINS.

By force awkwardly applied to a joint when the muscles are unprepared, or by irregular action of these, the articulating apparatus,—the synovial or fibrous capsule, the ligaments, the tendons and their sheath,—are often stretched violently, or even torn. This accident is attended with immediate and excruciating pain, and the system often receives a considerable shock in consequence; the patient becomes faint, sick, pale, and frequently does not rally for some time. Great and instant swelling arises from effusion of blood and serous fluid; there is discoloration, as after bruise, and generally in the course of the tendons on the aspect of the limb opposite to that towards which the joint has been twisted. If the extremity is not disused, inflammatory swelling supervenes; this may, and often does, lay the foundation for disease of the joint. To effect the cure of even the most severe sprain, little more is required than rest of the parts, in a position calculated to relax the muscles and favour the return of blood. Hot fomentations afford great relief, and after a short time absorption proceeds rapidly; the lesions are repaired, and the motions of the limb restored. Gentle friction and support by an elastic bandage (those of caoutchouc answer admirably, applied over a thin stocking) may be resorted to with advantage; but not till after the subsidence of all painful feelings, and until the chance of inflammatory action has passed away. If inflammatory action has been roused and encouraged

by imprudent use of the part, or injudicious management, then active and antiphlogistic treatment must necessarily be adopted: perhaps even abstraction of blood by venesection may be required; at all events, the free and frequent application of leeches must be employed; antimonials and purgatives are exhibited, warm fomentation is continued, and strict rest, with attention to the position of the limb, is still enjoined.

In recent and slight sprains and bruises, a weak solution of the tincture of arnica montana seems sometimes to afford relief, and to favour the absorption of effused blood. In these injuries, the bad effects of an injudicious and untimely use of stimulating frictions, and cold evaporating lotions, are often observable. The ankle and wrist suffer most frequently from accidental twists; but all the articulations, great and small, may be so affected,—the shoulder, hip, elbow, knee; and the latter joint is subject to a subluxation in consequence of laceration of the internal lateral ligament. This injury is most frequently met with in females, which is attributable to the natural inclination inwards of the bones of the thigh and leg; it is slow of being recovered from, and support is required for a long period after the accident. A similar injury is met with in the articulations of the phalanges of the fingers, and, when at first neglected, proves very troublesome. A straight and proper position must be preserved, and the part must be kept at rest for a considerable time.

LUXATIONS.

Displacement of the articulating extremity of any bone is immediately followed by change in the shape and contour of the limb, by alteration in its length, and by marked abridgment of its motions; complete luxation cannot occur without laceration of the capsular ligament to some extent, and very generally there is considerable lesion of the surrounding muscles or tendons. Dislocation is the result of irregular action of the muscles, or of force applied to the distal extremity of a bone, either directly or indirectly. The diagnosis betwixt bruise of muscles, sprain, fracture, and dislocation, is sometimes attended with a little difficulty, and this difficulty is always increased by delay-

ing the examination. In the first instance, before great effusion has taken place, and more especially before inflammatory swelling has supervened, the injured part can be well observed and manipulated; the change in its form can be perceived, the position of parts and the extent of motion ascertained, and the existence, or not, of crepitation satisfactorily made out; all this is effected, at the proper period, with comparatively slight suffering to the patient; at a later stage, the signs are obscured, and every attempt at motion is productive of the most lively and excruciating pain. At whatever time the examination is made, a correct notion of the state of the injured parts must, in all cases, be obtained, for the sake of the patient's future welfare, as well as for the surgeon's reputation. The existence of luxation being ascertained, common sense will point out the propriety of immediate reduction; and this can never be effected with such facility as on the spot where the accident has happened, whilst the patient is yet low and weak from the shock, relaxed in all his muscles, and unprepared to resist. The shoulder, and even the hip-joints, are easily reduced in these favorable circumstances, and even by unprofessional persons—as is sometimes witnessed in the hunting field, for example. Generally speaking, the longer the period that is allowed to elapse betwixt the occurrence of the accident and the attempt at replacement, the greater will be the suffering of the patient, and the trouble and difficulty encountered by the surgeon. Advantage will always be derived, when difficulty of reduction is anticipated; by putting the patient off his guard, and placing him in such a position as to prevent his muscles from acting powerfully in opposition to our efforts. The patient should be kept in conversation; and he may be nauseated, or weakened for the time, by the exhibition of antimony, by the employment of tobacco in various ways, by bleeding, or by the use of the warm-bath. The muscles can be tired out, though not without much agony, by being kept long on the stretch, as by pulleys or a screw; but this is only called for, and resorted to, in the reduction of luxations of the larger articulations, and especially when of long standing. The degree of force thus applied must be duly and prudently regulated, otherwise much mischief and

danger may result. Laceration of nerves, causing permanent paralysis, of arteries, giving rise to aneurism, fracture of bones, and tearing of muscles, have been the results of the employment of unwarrantable and forcible extension. It would be better to leave any joint unreduced, than subject a patient to such pain and hazard. An unreduced dislocation renders a limb unserviceable for a time, but ultimately such alterations take place in the form of the bones, in the attachment of the muscles, and in their actions, as to allow the member to be again brought into use. The muscles which had shrunk away through inaction, become again developed, and in a short time the patient feels but little inconvenience. In some luxations, efforts at reduction can be made with propriety, and with any chance of success, only at an early period; in others, the bones may, and have been, replaced at the end of many weeks, or even months. The date of the accident, the form and nature of the joint, the age and occupation of the patient, will influence the surgeon very much in his determination to attempt the reduction or not.

LUXATIONS OF THE JAW.

Luxation of the jaw can take place only in one direction, forwards, the condyles being thrown into the temporal fossæ; and this generally arises from irregular muscular action. One or both condyles may be displaced; if one only, the chin is twisted, the motions limited, and the mouth a little opened. If both have escaped from their articulations, the fixed, open state of the mouth, and projection of the chin, will leave no doubt as to the true nature of the accident, even in the mind of one not much experienced. Assistance is early sought, and the reduction is seldom a matter of much difficulty. The thumbs of the operator are protected by thick gloves, or by the folds of a handkerchief, or napkin, placed upon the molares, whilst the fingers embrace the base of the jaw and symphysis. By then depressing the condyles, at the same time raising the chin, the articulating processes are suddenly acted upon, and drawn into their natural situation.

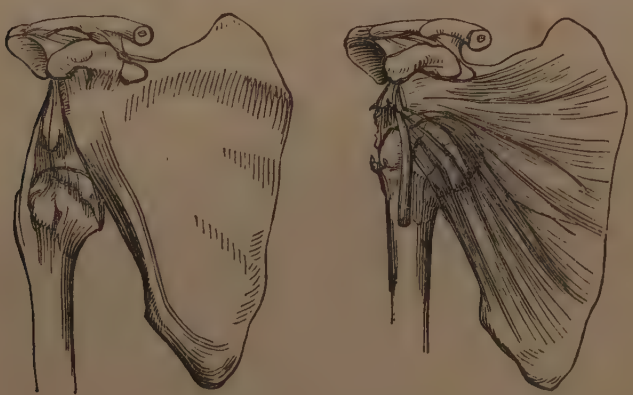
LUXATIONS OF THE UPPER EXTREMITY.

Luxation of the clavicle occurs at either extremity, and is easily recognised; that of the sternal end is the least frequent; both may arise from force applied to the point of the shoulder. The sternal end, when its ligaments are torn, projects forwards, is replaced without difficulty, but cannot readily be retained in situ. I have not seen it luxated in any other direction than forwards, and a little upwards. The extent to which the scapular extremity is displaced, depends upon the degree of laceration of its connexions. If the ligaments connecting the bone to the coracoid process be torn, as well as those at its termination, then there can be no misconception of the case. The arm falls to the side, and the projection and riding of the bone is quite apparent. Reduction is accomplished by raising the arm, and removing it from the side; and an attempt may be made to retain the parts in apposition by employment of the bandage directed, and delineated at p. 65, in treating of fractures in this situation; this apparatus is also applicable in the first-mentioned luxation. In both these injuries, difficulty of preserving the parts in their natural situation will always be experienced, and the cure is slow and imperfect. The bone, however, in time, contracts adhesions, and the limb regains its power and mobility.

The head of the humerus is perhaps more frequently luxated than any other bone; nor can we be surprised at this circumstance, when we look at its free and extensive motions, and the shallowness of the cavity on which it rests. The displacement takes place from falling with the arm extended, and abducted; and the head of the bone is forced out of the socket, or drawn from it by the muscular action, either downwards or forwards. It rests on the inner edge of the inferior costa of the scapula, as represented below, or under the coracoid process. It may occupy some intermediate position; and occasionally, though very rarely, it is displaced backwards, and lies under the spine of the scapula. I have seen but one such case; only two are mentioned by our greatest authority on the subject. The dis-

location on the dorsum of the scapula is a very rare accident. Sir A. Cooper relates a case lately, in which it was caused by the violent convulsions of the patient during an epileptic seizure. It may usually occur from some violent resistance to the arm while it is stretched forwards. The nature of the accident is recognized by the depression below the acromion; the absence of the bone from its natural situation; the space between the head of the bone and the coracoid process; the projection of the head of the bone upon the back part of the glenoid cavity or inferior costa of the scapula; and by the head of the bone being felt filling the space between the inferior costa and the spine. The arm is very immoveable in this accident. The elbow is separated from the side, and directed somewhat forwards.

The capsular ligament is rent in all complete luxations; the fibres of the subscapularis are torn and separated, the bone being pushed through them, towards either the upper or lower margin of the muscle,—as seen in the second of the annexed sketches, taken from the dissection of a very old displacement of the humerus. The fibres of the supra and infra spinatus



are stretched, the long head of the biceps is displaced, and its sheath lacerated. The patient suffers great pain, more especially when the dislocation is into the axilla. The limb is benumbed, and soon becomes distended and swollen, owing to the pressure on the axillary vein and plexus of nerves. In all

forms of this injury, there is a remarkable flattening to be observed under the acromion. The limb is fixed, the elbow projects from the side, and it is impossible to abstract or bend the upper arm to any extent, unless through the motions of the scapula, which soon become much more free than in the natural state. In the luxation downwards, the limb is elongated, and the change is very striking and apparent; its extent can be ascertained exactly by measurement from the point of the acromion to that of the elbow. In the luxation forwards, the limb appears somewhat shortened, and the elbow is projected outwards and backwards. The head of the bone can be felt by careful examination, in any of the new positions which it occupies; in manipulating for this purpose, the arm must be removed as much as possible from the side, by grasping the elbow, whilst the fingers of the other hand are pressed into the axilla. The head of the bone can be seen and felt on the inferior and mesial aspect of the coracoid process both before swelling has occurred, and after its subsidence. The history of the accident, the immobility of the limb, and a careful examination, will, in all recent cases, guard the practitioner against error in diagnosis.

The difficulties increase in proportion to the delay in the examination. At the end of some weeks, whatever the injury has been, whether fracture or luxation, the immobility of the limb will be the same, and no conclusion can be come to in consequence of the absence of crepitation; a careful examination of the head of the bone, and its relations, with attention to the history of the case, can alone be relied upon. In very recent cases, a considerable obstacle to reduction seems often to arise from the state of the capsular ligament; the rent may embrace the neck of the bone, as is frequently shown by further laceration occurring on its return to the glenoid cavity. The action of certain muscles, particularly the deltoid, supra spinatus, and biceps,—will, after a time, be opposed to the removal of the head of the bone, more especially from the axilla. When such difficulty is experienced, the limbs must be placed so as to relax these as much as possible. The arm must be abducted whilst the fore-arm is bent; and this position of the fore-arm is advan-

taneous, besides, as affording the means of performing rotation, by which the bone is often brought into a position favorable to its return by muscular action. In most cases the surgeon may succeed in his object without assistance, for he can make both extension and counter-extension readily enough. He may seat the patient in a chair; he then rests his foot on the seat, and places the luxated arm over his knee; he abducts the arm well, and using the humerus as a lever, extends the limb; then raising the head of the bone, he brings it into such a position as to permit it to slip back into the glenoid cavity. The reduction is perhaps better managed, however, by placing the patient in a recumbent position; the surgeon makes counter-extension by placing his heel (having of course pulled off his boot) in the axilla of the displaced arm, whilst he makes extension by grasping and pulling the wrist with both hands. If difficulty be felt, the extension should be made from above the elbow, by means of a jack-towel passed round and secured by a clove hitch, as represented in treating of luxation of the thumb. By turning the patient a little to the sound side, the extension can be made backwards and outwards. Should either or both of these means fail, the patient may be seated on the floor, whilst a strong assistant grasps him in such a way as to fix the scapula. The surgeon places himself on the injured side, and adjusts his feet so as to meet those of the assistant opposite; he then makes continued extension by means of a towel or lacque, secured above the elbow. The luxation backwards may be reduced by the heel on the axilla by making extension forwards or downwards. Sir A. Cooper mentions the following method by which he succeeded easily in reducing this displacement: "The patient seated upon a chair, his elbow at right angles, I raised his arm and carried it behind his neck, so as to bring the hand across the back of the neck to his opposite shoulder, then forcing the elbow back and pressing upon the head of the bone, I pushed it under the inferior costa of the scapula, and it instantly returned into the glenoid cavity." In cases in which unsuccessful attempts have been made, or in which difficulty in effecting reduction is anticipated in consequence either of the great muscular power of the individual, or of the period that has been allowed to elapse

betwixt the accident and the proposed attempt, it will be prudent, on the part of the surgeon, to provide means for keeping up powerful extension, with the view of tiring out the muscles. Several assistants may be employed to make extension; to fix the patient, a broad belt of canvass or leather is used with advantage, the arm being passed through a suitable opening in it, which is made to embrace and fix the scapula by a few straps and buckles; the ends of this surcingle are then secured to some immoveable point. But extension by assistants is not so steady as that by mechanical means; pulleys are accordingly used in general, and by them a steady and certain extension can be made and maintained. They are attached by hooks to a band passed round the lower end of the upper arm, and to a ring fixed in the floor or wall on the opposite side of the apartment. Before applying the lacque to the arm, it is advisable to protect it as far as possible from bruising, or abrasion of surface; a damp towel answers the purpose, and does not readily slip. During the extension, rotation can at the same time be resorted to by means of the bent fore-arm; and by passing a towel under the head of the bone, attempts may also be made to alter its position.

The auxiliary means already noticed at p. 114 may likewise be employed. In luxations of many weeks' standing, the probability of success or failure must be well considered; the patient must be made aware of what the chance actually is, and of the pain and risk to which he must be subjected in the attempt at reduction; his situation in life must also be looked to, and his feelings in the matter understood. If an attempt is thought advisable and agreed to, the judgment and prudence of the surgeon must be exerted in deciding upon the duration of the experiment, and the degree of force employed; he must not abandon his efforts to restore the limb to its original state, so long as a fair chance of success presents itself, nor must he heedlessly persist in using violence which may possibly endanger the patient's life. It is impossible to lay down any general rule on this subject; it has been proposed to employ a dynamometer to regulate the degree of extension, but the force must be varied according to the age, sex, and muscular power of the unfortunate

patient—circumstances which can scarcely be measured by any mechanical contrivance: in fact, reliance must be placed in the skill, judgment, and conscientiousness of the practitioner, in this, as in all other surgical cases.

[Up to what period is the surgeon permitted to attempt the reduction of a dislocation? This has been variously fixed by different writers. Desault never attempted them after the third month; and our highest English authority on these matters, Sir A. Cooper, limits us to three months for the shoulder, and two for the hip. Numerous cases, however, are recorded in which they have been successfully replaced long after the time here mentioned. B. Bell has reduced them at four months, and does not consider a dislocation old, until the sixth month. Dr. McKenzie, of Baltimore, replaced a dislocated os humeri six months after its luxation, and Mr. Kirby, of Dublin, was successful in a nearly similar instance. Macfarlane has reduced a luxation of the femur at the end of sixty-five days; M. Dupuytren succeeded in a like accident on the seventy-eighth day, Mr. Liston himself, has replaced the head of the femur thrown upon the pubes, on the eightieth day, and my friend, Dr. T. F. Betton has successfully reduced a luxation of the thigh into the ischiatic notch of eleven weeks standing. A backward dislocation of the humerus is reported by M. Sédillot, in which reduction was happily effected one year and fifteen days after the accident; and Campaletti, of Trieste, has reduced a backward luxation of the fore-arm seventy days after the receipt of the injury. But notwithstanding these, and many other successful instances that might be cited of the reduction of dislocations of long standing, too much attention cannot be paid to the excellent advice of Mr. Liston on this point, as injuries of the most serious nature have sometimes arisen from attempts made to replace them. Malgaigne, Roux, and others, have produced fractures of the bones. Loder saw mortification and death follow the reduction of a luxated humerus of several months standing. Flaubert reports several instances of paralysis of the arm which followed similar attempts. A case occurred to M. Lisfranc, in which death took place from apoplexy three hours after the reduction of a dislocated arm of four months standing, probably brought on by the severe exertions made to return it. Pelletan, C. Bell, Key, and Flaubert, have each witnessed cases in which the axillary artery was ruptured—the latter in a case which had been luxated only eleven days. Prof. Gibson, of this city, has reported two similar instances; the axillary artery having been found in both, to have contracted firm adhesions with the head of the bone.

Even after luxations of long standing have been reduced, inflammatory action is sometimes set up around the joint, giving rise to serious accidents. An instance in which suppuration followed the replacement of a luxated femur of twelve weeks standing, may be seen in the American Journal of the Medical Sciences, vol. 21, and the following case, which occurred latterly in my practice, affords a good illustration of it. A stout countryman, aged 25, consulted me in December, 1840, on account of a downward luxation of the head of the right humerus, received forty-eight days previously. The symptoms of the injury were well marked, and on the 21st, the pulleys were applied. The extension was made gradually, and moderately, for fifty-five minutes, previous to, and during which time, a solution of tartar emetic was freely given, and a large bleeding resorted to. At the end of the period mentioned, the head of the bone was returned to its socket—all deformity disappearing. Two days after the reduction, he was attacked with inflammation around the orifice made in the left arm by venesection, which went on to suppuration, and an incision for the evacuation of the pus was made in the lower part of the limb on the 28th. The right shoulder which had become hot and swelled soon after the reduction, despite the means employed to allay the inflammation, presented on the 30th more swelling, and an obscure sensation of deeply seated pus. On the 31st fluctuation was more distinct. A free opening was now made, and gave issue to near a pint of well, formed matter. After the opening of the abscess, the discharge continued large till towards the middle of February, during which period he suffered from several attacks of erysipelas, which, at the time, was prevalent in the hospital. After this date, the discharge gradually lessened in quantity and became more serous. Early in March, an abscess formed at the posterior part of the axilla, which was opened and discharged freely. By the 7th of April, the opening had closed, and all heat and swelling had left the part. On the 26th of the same month, he returned home, the head of the bone being evidently in the socket, though the parts about the shoulder were still much hardened and stiff.]

After reduction of a luxated humerus has been accomplished, it is advisable to place a small pad in the axilla, and to secure the arm to the side for a few days by the turns of a broad roller. Luxation is apt to occur again and again in the same joint, but more so at some distant period; as at first the stiffness and pain will render the patient anxious to preserve the limb at rest, and not to expose it to the risk of fresh injury. The precaution of

fixing the arm can do no harm however; on the contrary, the more steady it is preserved, the more rapid will be the absorption of bloody effusion, the subsidence of pain, and the restoration of the functions of the limb. Warm fomentations may be used with relief and benefit.

Luxation of the radius and ulna is even a more common occurrence in young subjects, than the injury which we have just considered. It is often overlooked, misunderstood, or neglected, until the time has passed at which reduction can be attempted

with safety and success. The most common dislocation is that in which both bones, still connected by their interosseous and orbicular ligaments, escape from their situation, and are drawn backwards on the posterior surface of the os humeri. The coronoid process is received from the fossa, from which the olecranon has been dislodged; the capsular ligament is torn on the fore part, and the fibres of the biceps and brachialis are put upon the stretch, and often considerably lacerated. Before the articulating processes are fully developed, and whilst the ligaments are yet weak, this accident occurs very readily from wrenches of the limb, or from force applied to the further extremities of the bones,—as in falls on the palm, the fore-arm not being fully extended. The limb is fixed in a slightly bent position, and is much deformed and shortened; the olecranon process, on comparing it with the condyles, instead of being rather on the distal side of a line drawn from their apices across the back of the elbow, is found to be placed much higher; the head of the radius

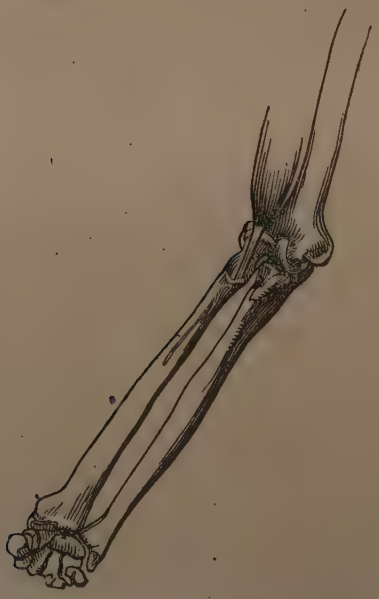
can be felt to move on the posterior surface of the outer condyle, on performing rotation, and this motion is imperfect; the articulating extremity of the humerus projects on the fore part, and its depressions and eminences can be distinctly felt and seen, before swelling has supervened,—or after the parts have become quiet, and when the luxation is irreducible. This period very soon arrives even in young patients; and in adults, in whom the injury is by no means very frequent, the obstacles to reduction are greater, the processes and depressions of the bones being more defined, the ligaments more rigid, and the muscles more powerful. Within a few hours or days, before the bones have become well settled in their new position, reduction may be readily enough accomplished; and even within a fortnight I have often succeeded without much difficulty. In a few instances success has followed the efforts at reduction about three weeks after the occurrence of the injury, and perhaps a few days later. In several cases of long standing, and at different ages, in males as well as females, I have tried and assisted in attempts to reduce the bones—but in vain; although nothing was left undone in the way of preparation, or in the extent and direction of the force. The joint could be loosened, but the coronoid process could not by any effort be made to slip over the end of the humerus. Considering the difficulty of reduction, the risk that may in young patients arise from the pulling and twisting of the articulating apparatus, and the possibility in some delicate habits of inducing disease of the synovial membrane,—it behoves the young practitioner to make a most careful examination of the effects of accidental violence in this situation, and to make up his mind early on the exact circumstances and the correct mode of proceeding; and that should be forthwith adopted without hesitation or delay, were it for no other object than

to relieve the patient from pain and apprehension. The plan usually recommended, and followed by the best authorities, is to bend the fore-arm upon the upper arm forcibly, and with as long a lever as possible, by grasping them, and at the same time placing the knee on the fore part of the joint, as one would try to snap a rod over it: or it is recommended to bend the joint, by placing the fore part of the arm against a bedpost or the back of a chair, and then to act upon the wrist. In this way success may be obtained in recent cases, but I have seen this plan tried again and again in vain; and were force thus applied suddenly and violently, there is a possibility of separating the olecranon process. A better mode of proceeding, in my opinion, and one which I have successfully pursued in numerous instances for the last twenty years, is to extend the humerus upon the scapula, and the fore-arm upon the humerus as much as possible, the patient being seated on a chair, and the limb brought behind him; the surgeon then makes extension by grasping the wrist with one hand, and counter-extension with his other placed against the posterior aspect of the scapula, the thumb resting in the axilla. Or the patient may be placed prone on a mattrass, the extension being then made by pulling the limb behind the patient with both hands, whilst counter-extension is effected by the foot placed against the inferior costa of the scapula, or by assistants holding a jack-towel passed under the axilla. In very difficult cases, the pulleys may be used, the direction of the force being the same as already indicated. The return of the bones into their proper relations will at once be ascertained by the change of form which the joint assumes, by feeling the ends of the bones gliding over one another, and by the facility of afterwards bending the fore-arm to any extent.

Displacement of both bones laterally is met with, though rarely, the olecranon process being placed upon either the outer or inner condyle; in the latter case the head of the radius rests in the fossa on the posterior aspect of the humerus. In all the luxations of the elbow, an unnatural degree of lateral motion is permitted. In the lateral luxation, an equally careful examination is necessary as in the ordinary accident, in order to detect the exact nature of the injury; and the surgeon must be equally

prompt in adopting the requisite treatment. In both cases, extension should be made in the same direction, but, in the former, some lateral pressure upon the ends of the bones may be resorted to, in order to secure their proper adaptation.

The ulna has been displaced, to a certain extent, without the radius following; and this may happen through fracture of the coronoid process. Or the radius is dislocated without the ulna leaving its natural position, and this displacement occurs either backwards or forwards upon the outer condyle. The former displacement is rare; and I can recall to my recollection but one case, which occurred in a lad brought to the Edinburgh Royal Infirmary many years ago; but the luxation forwards is more common. In this case the fore-arm cannot be readily flexed on the upper arm; some swelling will be observed on the anterior part of the humerus, and on rotating the radius, its head will be felt in its displaced position. The olecranon process will be felt occupying its usual position. In either case the orbicular and interosseous ligaments must be torn; and the end of the bone is drawn still farther from its situation by the action of the biceps, when the fore arm is extended thus.



The reduction of luxation backwards is effected by making extension from the hand, and at the same time bringing the limb into the prone position. In that forwards, the bent and supine position is to be preferred, so as to relax the biceps; and whilst by grasping the hand extension is made, the head of the bone is pressed into its place. A pad should be placed in the bend of the arm; and this, as well as the proper position of the limb, should be maintained for some weeks, so as to afford time and opportunity for reparation of the injured ligaments.

Many of these luxations are left unreduced from various causes, but, most fortunately, the functions of the limb are not necessarily destroyed in consequence. For a time, the motions are retarded and weak; gradually, however, and often most unaccountably, the bones and muscles get accommodated to the change of circumstances. In the unreduced dislocation of both bones backwards, the olecranon process becomes shortened, a new articulating surface is formed anterior to the coronoid, and,

after a time, the motions become extensive; the fore-arm can be bent at right angles, or even farther; the limb becomes strong, and nearly as useful as if no injury had been inflicted. In dislocation of the radius forwards, the limb at first is fixed in the extended position, yet flexion is, in the end, performed almost to the full extent.

The preceding sketch is from the arm of a lad who, eight years previously, had met with this injury. The signs are well marked,—particularly the projection caused by the rising of the end of the bones in the extended position, and the hollow behind. The degree to which flexion could be performed was very remarkable; the fingers could be placed on the point of the shoulders, and this took place without much change in the position of the radius. This bone seemed to be somewhat shortened, and the form of its head changed; the one bone probably slid upon the other, the interosseous and other ligaments being relaxed and accommodated to the circumstances. The hand has in this sketch an odd and deformed appearance; perhaps the patient had suffered from paronychia: or the hand may have been compressed in the mould of the plaster-cast from which this sketch was taken.

Dislocations of the wrist are of rare occurrence. Fracture of the distal end of the radius, and swelling from effusion of blood in the sheaths of the tendons and under the fascia, must not be mistaken for this injury. The carpal bones may be forced from their situation by the application of great force to the palm or dorsum of the hand, and may rest on the anterior or posterior aspect of the bones of the fore-arm; the reduction is not a difficult matter, and is effected by extension accompanied with pressure on the projecting bones.

Dislocation of the phalanges of the fingers is easily recognised. It cannot be produced unless by the application of great force, as in the following case.

Mr. C., one of our most attentive pupils at the hospital, in catching a heavy iron ball,—which fell from a height, and had thus acquired great velocity,—dislocated the middle finger of the right hand at the second joint. The ball was received principally on the palmar aspect of the distal phalanx; this was

forced violently back, and the head of the middle one was thrust forwards on the anterior aspect of the proximal, probably betwixt the lateral ligaments, without much laceration. Reduction was effected immediately, and with facility. Indeed, the only difficulty in such displacements is to procure the means of extension; usually, it can be made to the requisite extent, by a small cord, neatly fixed by a clove hitch close to the apex of the finger.

To reduce luxation of the proximal phalanx of the thumb, on the posterior aspect of the metacarpal bone, has occasionally been found puzzling enough, and is never accomplished without some little trouble. This difficulty has been attributed to the action of the short flexor, and to the tight embrace of the lateral ligaments round the neck of the bone. By making the extension across the palm of the hand, the one obstacle is done away with; but in general the strength and rigidity of the ligaments are not easily overcome. Before the reduction has been effected, it has been in some cases found even necessary to divide one of the ligaments; the external is most easily reached; it is cut across by introducing a narrow-bladed and lancet-pointed knife (such as is used by some practitioners for exploring tumours) through the skin at some distance, and directing its edge against the resisting part. It is certainly more advisable to have recourse to this proceeding, which is not very painful, and unattended by dangerous consequences, than to leave the dislocation unreduced. The bone is replaced at once, without the slightest difficulty, as soon as the ligament has been cut.

In the "Elements of Surgery," I have related one case of a very old man, much intoxicated, in which it was found absolutely necessary to perform this operation before reduction could be accomplished. Shortly before giving up charge of the Edinburgh Hospital, a lad, under fifteen years of age, was admitted with luxation of this joint, of fourteen days' duration. In his case, also, it was impossible to effect replacement until the ligament had been divided. Within a week he returned, having again fallen and displaced the bones; but the reduction was on the second occasion made readily enough.

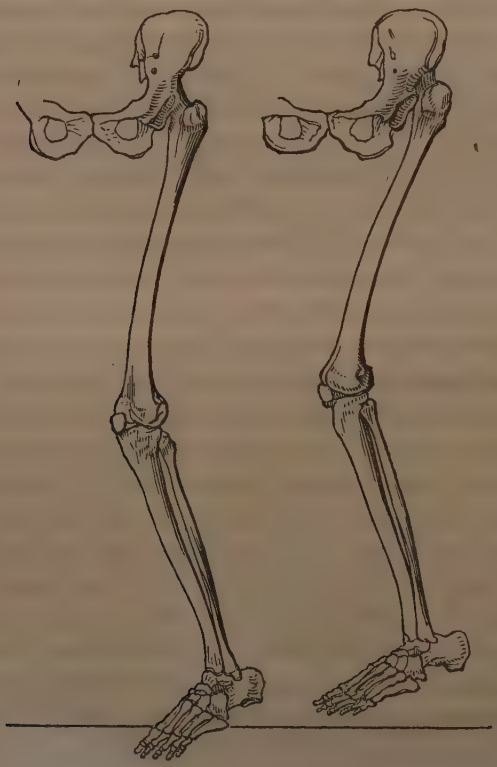
The appearance of the joint when displaced, and the application of the hitch or noose so often spoken of, are shown in the

accompanying sketch; a piece of thick leather, or a wetted bandage, should be put on before the noose.

In order to make effectual counter-extension, a handkerchief should be passed under the metacarpal bone, and attached to some fixed point.

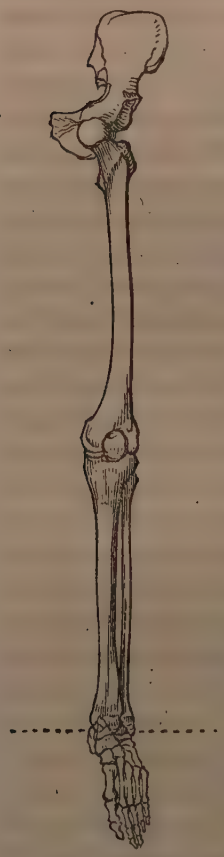
LUXATIONS OF THE INFERIOR EXTREMITY.

Displacement of the head of the femur takes place in four different directions, as shown in the plans accompanying this sec-



tion. The most common is attended with marked shortening of the limb, to the extent of from one to nearly three inches, with inversion of the toes,—as represented in the plan on the right of the preceding page. The head of the bone rests on the dorsum of the ilium, behind and above the edge of the acetabulum. The capsular and round ligaments are torn; all the muscles are changed in their positions and actions; the quadratus, gemelli, and external obturator are overstretched; whilst others, the pectineus pyriformis, the glutæi and triceps, are relaxed; and this latter class are supposed principally to oppose efforts at reduction. The knee of the affected side, slightly bent, lies over the opposite thigh, and cannot be far removed from it: in other words, abduction of the limb to any extent is impossible. The trochanter major is depressed; and unless the patient is very corpulent and muscular, or the hip loaded with effused blood, the head of the bone can be distinctly felt, more especially when rotatory motion is attempted. Luxation, in this situation, is occasioned by force applied to the lower end of the bone, as by the limb being bent under a person, and to the opposite side. Fracture of the upper part of the bone, through its neck or trochanter, as has already been noticed, may be attended with inversion, and may consequently, by a superficial observer, be mistaken for this luxation; but the history of the case, the greater mobility, the prominence of the trochanter, and, above all, the crepitation, will lead the careful surgeon to a correct diagnosis. Reduction may be accomplished immediately after the occurrence of the luxation, with scarcely any extension, and almost without assistance. In a few hours, however, when swelling, great stiffness, and pain have supervened, difficulty is to be anticipated; and means must therefore be provided to fix the pelvis, and make steady extension of the limb. A band should be placed in the perinæum—a folded sheet will answer the purpose—and this is fixed to a staple or ring: a towel is passed under the two sides of the band, and secured over the os innominatum of the injured side. A lacque is then applied,—as directed in speaking of the corresponding luxation of the upper extremity—above the knee; or what is better, a jointed metal ring, well padded, tightened by a screw or strong leather belt,

and fitted with straps and buckles,—is thus well secured; the pulleys are attached, and the extension made downwards and forwards steadily and gradually: after this has been continued, so as to tire out the muscles and diminish their resistance, rotation outwards should be performed by laying hold of the ankle, the leg having been kept nearly half bent during the progress of the extension. This manœuvre will often succeed at once, after the muscles have begun to yield, when the head of the bone has shifted its position, and come nearly opposite the acetabulum. The return of the bone is often first noticed by the patient, unless indeed it is accompanied with a loud snap: this noise, however, is not to be expected in cases of some standing, after the extension has been long persevered in, and the muscles have thus been incapacitated from powerful exertion. In such cases, it is often advisable to have the patient lowered and relaxed, by nauseating medicines, previously to the commencement of the extension.



The head of the femur is apt to slip over the acetabulum, with great attendant laceration of the ligaments, and to lodge in the thyroid foramen, in consequence of violent abduction of the limb,—as by a fall under a weight, with the legs spread. The extremity is longer than the sound one, by an inch and a half or two inches; the foot is not turned to either side, the trochanter is much depressed, and the limb cannot be carried towards the other. The body is bent forwards, in consequence of the psoas and iliacus muscles being put upon the stretch. In thin persons, the head of the bone may be felt towards the perinæum. Elongation of the limb cannot take place from any other injury, though it

may seem to have occurred, as in consequence of bruising of the muscles about the hip; but in this case there is always considerable eversion. In detachment of the trochanter major,—a rare case,—a degree of falling downwards of the limb occurs; but this arises from quite a different manner of accident, and the cause can be easily recognised. The first stage of hip-joint disease, more especially if the patient has met with any recent injury, is apt to be mistaken for luxation downwards; the limb appears elongated, the hip flattened, the motions abridged; but the whole member is wasted, the trochanter is prominent; motion of the joint can be effected in every direction, but with pain; and there is no difficulty in performing adduction. The previous state of the limb must be inquired into, when any doubt exists; for the adoption of means to reduce a supposed luxation, would be most mischievous in any stage of morbus coxarius.

The reduction of dislocation into the obturator foramen is effected by powerful adduction—by forcibly pulling one limb over the other. When the injury is of some standing, it is advisable to fix the pelvis by the perinæal lacque, and weary the muscles by extension with the pulleys. Sir A. Cooper has properly cautioned practitioners against carrying the limb forwards, in case the head of the bone should slip back and be received into the ischiatic notch, from which it cannot be displaced. With this caution fully impressed upon my mind, and acting in conformity to the rules laid down by Sir A., this accident occurred to me in a case of only a few hours' standing; the patient was a young and powerful man, and great difficulty had been experienced in the attempted reduction; yet, probably on accouut of the muscles being well fatigued, I had no difficulty in lifting the bone out of its new situation. The man had so far recovered in a few weeks, that he left his former line of life, that of a miller, and enlisted as a soldier.

Dislocation upwards and forwards, the head of the bone resting on the pubes against the ligament of Poupart, and outside of the femoral vessels, occurs in consequence of violent abduction, or rotation outwards of the limb; at least such is generally the statement made by the patient; but it is no easy

matter for a person who suffers a severe injury, who is instantly subjected to great pain, and becomes faint and sick, to give a very exact account of the attendant circumstances. The appearance produced by the round head of the bone near the surface, and in the situation indicated, will decide at once the nature of the case. There is some slight shortening of the limb, with eversion of the toes; extension backwards, and rotation of the limb inwards, are the means of reduction.

Dislocation on the dorsum ilii is of all hip luxations the most frequent, though by no means so much so as fracture in this situation; for one case of displacement the practitioner may expect to have presented to him at least twenty fractures. The two other luxations, so far as I have seen, are almost equal in frequency. Sir A. Cooper, whose field of observation has been very great, and whose admirable work will long be referred to for correct information on this subject, previously but imperfectly understood, has mentioned the luxation into the sacro-ischiatic foramen as the most common form, next to that on the dorsum. Of the three others I have witnessed a considerable number of instances; of this last, only the one already alluded to, and that was secondary. This luxation, Sir A. Cooper states, is both difficult to detect and to treat. In the displacement backwards,—as represented in the figure, p. 130, to the left,—the limb is shortened, but not to so great an extent as in that backwards and upwards, nor is the foot so much turned inwards. There is a great depression in the situation of the trochanter major, and the head of the bone cannot be felt. The extension is made forwards, the pelvis being bent upon the thigh by the position of the trunk. In this and in some instances

of the other luxations of the hip, power must be applied across the axis of the bone, in order to lift the head out of its unnatural position, and to bring it on a level with the cotyloid cavity, so that it may come within the sphere of action of such muscles as may pull it into its proper place. This is effected by passing a jack-towel under the top of the thigh, close to the perinæum, tying the ends of it together, and passing the loop over an assistant's neck; he is able, by raising himself, to act very strongly on the bone; or an assistant may be placed on a table or chair to pull at a band so placed.

LUXATIONS OF THE KNEE JOINT.

The patella is displaced to one or other side, more frequently outwards. To admit of the bone resting on the outer condyle, on its fibular aspect, the fibrous capsule must be weak and relaxed: or part of it must give way. I have had a variety of these accidents under treatment in private and hospital practice; but ere I saw the case, the bones had resumed their natural position; the patella slipped back of itself, the patient pushed it into its place, or the dresser or house-surgeon effected the reduction. When I was a house-surgeon—and I had the opportunity of occupying this situation in a large hospital for about two years—I never had the fortune to perform the good office of reducing a patella for any patient. Young anatomists and surgeons meet with a vast number of anomalous and extraordinary cases; they also rediscover many things.

Lateral luxation of the knee-pan, no doubt, does occur, but not so frequently as is said. The bone falls downwards when the tendon of the extensors is torn, or rather when separation of the muscular from the tendinous part takes place; and it would be drawn upwards were the ligament of the patella to be torn across. Of the former solution of continuity I have witnessed several instances; of the latter only one,—though I have been taken to see other cases in which it was supposed to have occurred. It may happen that the ligament of the patella gives way rather than the bone, which is certainly the weaker structure of the two. This rare case I saw through the kindness of

my friend, Mr. Fisher, of Argyll Street. It happened to one of the police force, of which Mr. F. has the medical and surgical superintendence. The man, of middle age, and muscular, was assisting to convey a prisoner to the station-house, and in the struggle was thrown on his back, with his right leg bent back under him; the entire bone was found drawn up on the fore part of the thigh fully three inches, even when the leg was extended. By placing the limb on an inclined plane, applying a bandage lightly so as to retain a pasteboard splint on the popliteal aspect of the bone, Mr. F. had brought the parts into their natural situation, and the case seemed to be going on very favorably.

These displacements are to be restored by relaxing the quadriceps; the leg is extended, and the thigh bent; if reduction does not follow, slight pressure, in the proper direction, will accomplish the desired effect. Partial displacement of the tibia from the end of the femur, with laceration of the fibrous capsule and lateral ligaments, is met with occasionally; and by position and rest may, after a time, be completely recovered from. Perfect luxation of the bones of the leg backwards, or to either side, is attended with terrible laceration of the parts, and extensive extravasation of blood; reduction is not difficult, but the after consequences of the injury are to be dreaded. The luxation is sometimes compound; and if there is great injury besides, perhaps amputation should at once be resorted to. Extensive wound of this joint—as in compound fracture of the patella,—and even wound with displacement of the tibia and fibula, have, however, been recovered from without loss of the limb.

LUXATIONS OF THE ANKLE JOINT.

Luxation of the ankle occurs in four directions, two of which, necessarily attended with fracture, have already been fully noticed. The foot is sometimes displaced backwards; the bones of the tarsus remaining in connexion with each other, the end of the tibia rests on the navicular bone, the heel is elongated, and the instep abridged. Or, the foot may be pushed forwards, the bones of the leg embracing and resting upon the calcaneum, and

the posterior surface of the tibia in contact with the tendo achillis; the foot is remarkably elongated, and the heel has disappeared; very generally, splitting of the tibia and fibula, or fracture of their processes, is found to have happened at the same time. Some forcible extension, whilst the bones of the leg are fixed, will sometimes be required, before the tarsus can again be pushed into proper form. When there is fracture, and an inclination to after displacements, the parts must be secured aright by one or more splints, or the limb may be laid in the apparatus described and delineated page 92.

The astragalus is sometimes torn from its attachment and pushed backwards, so as to lie betwixt the tibia and tendo achillis. A case of this kind is related in the "Elements of Surgery," second edition, p. 753. Occasionally, after violent wrenches of the foot, this bone is found lying on the fore part; and sometimes it is turned over upon itself, so that the aspect which articulated with the os calcis presents upwards. These luxations are either simple or compound: they often accompany breaking up of the other bones entering into the composition of the ankle joint, with extensive laceration of the ligaments, tendons, and integuments. The astragalus is perhaps almost completely detached from all the neighbouring parts, or it is broken; or, its connexions with the os calcis and os naviculare are separated, and it is thrown out of the wound along with the tibia and fibula; one or other of these bones, or both, are broken in some of the accidents under consideration; and very often the protruded parts suffer, still further, by rude contact with foreign bodies.

Contrary to what might be expected to happen, from an examination of the relations and strong connexions of the parts, it would appear that complete displacement may occur without fracture of the bones of either the leg or tarsus. The most implicit confidence may be placed in the accuracy and discrimination of Mr. Duncan, who admitted and has described the following case, reported in the Lancet, vol. ii. 1834—35, p. 650.

"William Broughton, ætat. 21, was admitted July 16th, under the care of Mr. Liston. He was one of the men working in a

tunnel of the London and Birmingham Railway, when a heavy load of clay fell upon the labourers; he observed the mass of earth giving way, and attempted to retreat, but in doing so his foot got entangled under one of the sleepers of the railway, and he was crushed. When brought into the hospital, he was in a state of collapse; the skin was rather cold, and covered with a copious sweat; both thighs were much contused about the middle and upper parts; the right was much swelled on the outer side, where there was a small wound, of some depth, which admitted the little finger; over the external malleolus there was a transverse wound about three inches long, exposing the cavity of the joint, and from this wound the bone projected about one inch and a half; the foot was very much inverted, and placed almost at right angles; the internal malleolus on the inner side of the astragalus, and the articular surface of this latter bone, were seen through the wound. After a most careful examination by Mr. Duncan, the house-surgeon, no fracture could be detected. The dislocation was very easily reduced by extending and everting the foot; the limb was then put upon a splint; and as soon as the oozing from the wound had ceased, the edges were approximated by isinglass plaster. The poor fellow made a perfect recovery.

Compound luxation may occur in any of the four directions indicated, but generally to the inner or outer side. It is often caused by a fall from a height,—very frequently by a leap from a carriage in rapid motion. The foot being first arrested in motion, the direction and nature of the luxation and fracture will depend upon the position of the person, and the manner in which he alights. If he leap from the off-side of a carriage, and the right foot come first in contact with the ground, the rent in the soft parts will be on the inner side; either the tibia will be protruded, singly, or with other bones, and almost certainly with injury of some of them; but if the left foot be first stopped in its progress, the bones will appear through an opening on the outer side. The injury is generally the result of very great violence, but occasionally it is produced by apparently trifling accidents. One of the worst cases I have seen happened to an old publican,

merely, it was said, by his falling out of bed whilst in a state of helpless intoxication; it certainly happened in his bed-room, where I found him with a pool of blood round his injured limb, complaining that "the whole injury had resulted from mismanagement of a soft corn."

The displacement must be immediately reduced; the wound is to be put together as neatly as possible, and lightly covered. The state of the ends of the bones may render it advisable to remove some portion of them whilst protruded, by means of an amputation saw, and before any attempt at adjustment is made; the whole or part of the astragalus, if much disconnected from the parts around, may be taken away, by separating its remaining connexions with a knife or scissors: the reduction will then be very readily effected, and generally less difficulty is felt in managing the case throughout, when it becomes necessary to remove portions of the bones, than otherwise; the swelling, tension, and pain are less, and the parts are more easily retained.

When the bones are comparatively uninjured, neither bruised nor comminuted, the question of removing any part of them cannot be entertained; the limb is placed on the apparatus represented at p. 92, as are all fractures of the leg, simple and compound,—excepting only such slight accidents to one or other of the bones near the distal end, as have already been described. The progress of the wound can be seen; it can be dressed as occasion requires; means can be taken for the evacuation of any matter that may form,—and all without occasioning any suffering to the patient, or change in the position of the limb. The confinement to bed will be much shortened, and the health of the patient thus prevented from declining. In extreme cases, when there is great comminution of the bones, with laceration and bruising of the soft parts, as by entanglement in machinery, or by the passing of a heavy body over the limb, primary amputation may be deemed advisable. This step will be taken when gangrene would otherwise inevitably follow. Various circumstances, as the age, the previous habits, and state of constitution of the individual, will materially influence the decision in such cases.

A sketch is here introduced of a limb which was removed shortly after the accident. The patient was of healthy constitution, and under forty years of age. Many limbs much more mutilated have been preserved. The integument has been removed, and the parts so far dissected, in order to show the displacement of the astragalus; this bone might have been removed with every chance of a favorable termination.

[Compound dislocations of the astragalus were formerly thought to require immediate amputation, but a sufficient number of observations are now collected, conclusively to prove that the limb may be saved, though it has generally been deemed necessary to remove the bone. Indeed, in the majority of these cases, this is so much detached from the adjacent parts as to be unable to support its vitality, and will, if returned, produce all the bad effects of a foreign body introduced into a joint. Contrary to what might be supposed, the simple dislocation of this bone is attended with fully as much danger to the limb and life of the patient as when complicated with laceration of the integuments, and an examination of the few cases contained in the records of our science, shows that surgeons are at variance in regard to the best mode of treatment of them. All agree that efforts should at first be made to restore the displaced bone; but this failing, as in nearly every instance it must where the luxation is complete, what course is to be pursued? Is the bone to be suffered to remain in its new situation, or is it to be removed? If permitted to remain, violent inflammation of the integuments and joints is almost certain to follow, in which event there is great danger, from the state of tension the parts are placed in, of gangrene occurring and necessitating the amputation of the limb, if not endangering the life of the patient; and even should

the dangers of inflammation and gangrene be escaped, and a natural cure take place, great deformity and lameness must necessarily ensue, and the patient will remain more or less liable to ulceration of the skin over the projection on the outer part of the foot. For these reasons, we deem the practice of excising the astragalus far preferable to leaving the cure to nature; and the limb cured by the removal of the bone, though shortened and anchylosed, will be found both more useful and sightly than the club-foot deformity left after a natural cure.

The following is an example of this rare form of accident that I witnessed at the Pennsylvania Hospital, in which the practice here recommended was pursued, though in this instance without a happy issue.

Wm. Summerill, æt. 30, was admitted September 26, 1831, under the care of Dr. Barton. An hour previous to admission, while descending a ladder, he slipped and fell in such a manner as to throw the entire weight of his body upon the outer part of his left foot. Upon examination, the foot was found to be turned inwards, and nearly immoveable. A slight depression existed immediately below the lower end of the tibia, and there was a considerable hard and rounded projection on the outer part of the foot, a little below and in front of the extremity of the fibula. The skin covering this projection was reddened, but not excoriated. There was no fracture of either bone of the leg. These appearances rendered it evident that the injury was a dislocation outwards and forwards of the astragalus; and a short time after admission efforts were made by Dr. Barton to reduce it. These efforts were continued for a considerable time, but had no effect in changing the position of the bone. In consultation, six hours afterwards, attempts were again made at reduction, which not proving more effectual than on the first trial, the excision of the displaced bone was determined upon. This was at once done, and the bone seized with forceps was easily removed after the division of the integuments and a few ligamentous fibres, that continued to connect it to the adjoining parts. After removal, it was discovered that about one half of the surface which plays in the lower end of the tibia had been fractured, and remained firmly attached to the extremity of that bone; and as it was judged that the efforts necessary to remove this would be likely to produce more injury to the joint than could arise from allowing it to remain, no attempt was made to extract it. The joint was carefully sponged out, and the sides of the incision brought accurately together by means of a suture and adhesive strips, after which, simple dressings and a roller were applied, and the foot, restored to its natural position, was placed in a fracture-box.

September 29th, does not complain of limb; rested well; general symptoms good; dressings removed; no union; wound suppurating freely. Opium has been taken freely since the operation, and is to be continued; soft poultice to the part.

On the first of October, a small slough occupied a portion of the skin on the outer side of the foot, and the suppuration became much more free. Same treatment continued.

By the 15th, the discharge of pus had greatly lessened, and his general symptoms improved.

December 12th. To-day that portion of the astragalus which had been suffered to remain attached to the tibia was found to be carious and loose, and was removed. Constant pressure on the heel has produced ulceration of it. The limb is much swollen; wound has made but little progress towards cicatrisation; granulations are exuberant and of a light colour; secretion of pus still great; general symptoms good. A probe, introduced through either opening into the joint, shows the surfaces of the adjoining bones to be rough, softened, and evidently carious.

March, 1833. Since the last report, (a period of fifteen months,) various means have been resorted to for the removal of the carious portions of bone and cicatrisation of the wound, but unsuccessfully. At this time, the bones of the foot, and the ends of the tibia and fibula, are all diseased. The patient's general health has suffered severely from the long-continued irritation. He has well-marked hectic fever, accompanied by heavy night sweats; he has also frequent attacks of erysipelas of the limb, and diarrhœa. Amputation of the leg was now looked upon as the only means of saving his life, and was accordingly done on the 27th. The stump never took on a good appearance, showing no disposition to unite, and discharging a thin fetid matter. His diarrhœa returned a few days after the performance of the amputation; his strength failed; and he died on the 5th of April.]

Partial dislocation of the anterior bones of the tarsus occurs occasionally from falls from a considerable height, the patient alighting on the points of the toes: little can be done to reduce the dislocated bones. By rest and elevated position, together with fomentations, the inflammation consequent on such an accident will soon be subdued, and the patient be enabled to use his foot as well as ever. The following case occurred a short time ago in the North London Hospital.

J. H., ætat. 14, a bricklayer's boy, fell from a height of forty feet, and alighted on the extremity of the right foot. The liga-

ments on the dorsal surface of the foot appear to have started, the scaphoid and cuboid bones project a little upwards from their usual situation. The foot is half an inch shorter than the other one. The leg was elevated, fomentations, &c., but no attempt made to reduce the misplaced bones.

In about three weeks he left the hospital: he was able to stand on the foot. The instep appears higher than the other one, the foot is shorter by half an inch, and has a somewhat clubbed appearance.

Dislocation of the distal extremity of the metatarsal bone of the great toe will sometimes occur from direct violence. The following case is an example of it. J. B. M., ætat. 14, was thrown from his horse, which fell upon him, and in getting up trod on his foot: he had received a wound on the inner side of the foot opposite the distal extremity of the metatarsal bone of the great toe, the articulating extremity of the bone was protruding through the wound, and was broken off from the rest of the bone. The broken head of the bone was removed. The wound healed in about six weeks, and the patient had the perfect use of his foot.

ON DISEASES OF JOINTS.

Diseases of joints, of a serious nature, may originate in a variety of ways, and in any one of the tissues which enter into their formation. Often they are attributable to injury, as sprain or contusion; but this may have so slight, and so slowly followed by signs or symptoms causing alarm, as to be almost forgotten; the mischief is then supposed to arise spontaneously, and altogether through some vice in the constitution. Many persons certainly are so slightly constituted in these and other respects, that but very trifling causes operate in deranging the functions and structure of their organs and apparatus. Very generally it will be found that, at some time or other, force has been applied to a joint which has run into a diseased condition,—though, perhaps, long before swelling, or pain, or difficulty and awkwardness in raising it, or alteration in the form or size of the limb, have attracted attention. These circumstances indicate a

slow degeneration of the synovial membrane, of the cartilage, or of the surface of the bone, which, by judicious management in the early stages, may very often be prevented from making progress, and ending, as it would otherwise inevitably do, in complete disorganisation of the affected part, and serious deterioration of the general health.

In a great many cases presented to the surgeon, the exciting cause is palpable enough; a violent contusion has been inflicted, or the joint has been violently wrenched, and probably has not been kept at rest for a sufficiently long period, to allow it to regain its natural condition. The synovial capsule has been filled with blood; the joint may have been accidentally opened; or the bones in the neighbourhood have suffered solution of continuity, the articulating ends being split, and perhaps comminuted. A very good case is related in the "Lancet," showing the danger which may arise from fracture extending into a large joint. The patient's life was saved, under very desperate circumstances, by the opening of deep abscesses, and subsequent amputation of the limb. Inflammation may have commenced in the shaft of the bone, and terminated in abscess or necrosis; in such cases the epiphysis may become affected, and the joint thus be involved secondarily. The second case, copied from the "Lancet," vol. ii. for 1836–7, illustrates this occurrence well.

"Case 1.—S. L., aged 35, was admitted, March 27, under the care of Mr. Liston.

"*History.*—She states, that, on closing a door at the top of a flight of steps which she was about to descend, she was precipitated to the bottom, having at the same time her infant of one month old in her arms; in saving the child from injury, she fell with her left leg under her, she 'scarcely knows how.' She could not rise from her position without assistance. She sent for the surgeon who usually attends her, who ordered the application of several leeches to the knee, and in the course of a few hours she was brought to the North London Hospital.

"*Signs on admission.*—The knee was much swollen; there was great pain in the joint, on manipulation, and much unnatural motion. The leech-bites were still bleeding. Fomentations to be applied.

"March 28. Swelling much decreased. From the extensive and unnatural motion of the limb about the joint, Mr. Liston, at his visit, decided that at least the tibia was fractured; the limb was put up in one of his splints, and thereby much relief was afforded.

"April 4. Pain in the knee; on removing the bandages, some of the leech-bites were found ulcerated, and surrounded by a deep blush of redness. Water dressing, and the roller lightly over it.

"13. There is a good deal of constitutional irritation, and the integuments of the knee are in a state of erysipelas; there is a little purulent discharge in the popliteal space. Ten grains of the hydrarg. cum creta, followed by salines.

"14. Bowels much moved, great pain in the head. Dr. Thomson saw her, and ordered a mixture of camphor julep and ammonia.

"16. From this day to the 19th, she gradually became worse, exhibiting all the symptoms of typhus mitior. The leg has become of a dark livid colour, extending from the extremities of the toes to the trochanter major. The limb is tense and swollen, though not painful. Has an indescribable feeling in the head, not exactly pain. She has a constant uneasiness in the region of the heart, occasionally rendered much more distressing by the occurrence of spasm in the part. On applying the ear over this region, a sibilant rattle is distinctly audible. Pulse quick and weak. Twenty drops of sulphuric æther in an ounce of the decoction of bark, every four hours.—Brandy, wine, beef-tea, &c. Mustard cataplasm under the left mamma.

"20. Passed a restless night. Eyes wild, but she is rather more collected. The head to be shaved, and a blister placed on the nape of the neck. Leg much the same. Continue the medicines; two grains of calomel and one of opium every night.

"21. Slept all night. Tongue more dry and coated. On a careful examination of the leg, no fluctuation could be discovered.

"23. No better; complains still of the pain in the head and about the heart. Redness of the leg beginning to disappear. Leg tender on pressure. Continue calomel; omit the opium.

"24. No sleep during the night, fæces and urine pass involuntarily. Takes no nourishment; lips are wetted with a little wine; countenance extremely anxious; does not answer when spoken to; stares wildly around; voice nearly inaudible. Mr. Liston evacuated a small collection of matter which had formed above the condyles of the femur, close to the bone.

"25. Much the same; pulse weaker; redness of the leg gradually disappearing; her countenance indicates pain when the leg is touched; has not slept.

"26. No sleep; head to be again shaved; cold ice to the scalp constantly.

"27. No better; no discharge from the wound made on the 24th. As fluctuation was again perceptible, the wound was reopened, and about four ounces of laudable pus mixed with blood were discharged. Delirious; fæces and urine still pass involuntarily.

"28. Better; more collected; matter flowed from the wound, on removing the pledget of lint which had been inserted.

"May 8. Has continued to improve since last report. There is a free discharge from the orifice in the leg.

"15. Not quite so well; appetite not so good; discharge continues from several openings about the joint, which has been very loose and puffy for some time; the bones grate upon one another. The patient, after recovering from the immediate effects of the erysipelas and deep collection of matter, has again begun to fall off, to become hectic, losing ground every day. It was plain that the articulation was destroyed, and that amputation, if it could be ventured upon, would afford her the only chance of recovery.

"*Operation.*—The patient was brought into the theatre and laid upon the table, with her legs projecting over its edge, the affected limb being carefully supported by an assistant. Mr. Liston, standing on the outer side of the limb, transfixed the limb in the transverse direction, anteriorly to the femur, about five or six inches above the knee: and carrying the knife downwards, brought it out about two inches above the knee; by this means the anterior flap was formed. He transfixed the limb a second time posteriorly to the femur, carried the knife down-

wards and outwards, and formed a posterior flap, rather longer than the anterior. The flaps were held back by an assistant, and Mr. Liston divided the remaining soft parts by a circular sweep of the knife. The bone having been sawn through, and the vessels secured, the flaps were brought together by three points of interrupted suture. She lost only three ounces of blood. After the operation, she complained of great pain, which was relieved by half a drachm of tincture of hyoscyamus. Slept a little during the night.

"*Dissection of the limb.*—The tibia had been broken about two inches below the knee, and the split had extended into the joint; the fracture had united, but an opening, communicating with an extensive abscess all around the articulation, still existed in the cavity of the capsule. The apparatus of the joint was thoroughly disorganized; the semilunar cartilages were detached, floating about in the purulent secretion with which the thickened and softened synovial capsule was filled. The end of the femur was almost entirely deprived of cartilage, and very vascular; the crucial, lateral, and posterior ligaments were softened, swollen, and relaxed. Several abscesses in the cellular tissue, and in the neighbouring bursæ, communicated with the joint.

"June 27. The patient was very low and weak for some days after the operation, but she has gradually gained strength; the stump has healed; she is able to get out of bed, and is quite convalescent."

"Case II.—H. D., aged 13, was admitted May 22, under the care of Mr. Liston. He states that, about two months since, he was struck on the right ankle by a stone. He did not suffer any inconvenience from the blow until a week afterwards, when the joint began to swell; the swelling soon extending up to the knee-joint. The swelling and pain abated under the use of poultices. In the course of a few days, however, the ankle was attacked by inflammation. Mr. Smyth, of Vauxhall Road, was now called in to attend him, and a collection having formed in the neighbourhood of the ankle-joint, incisions were very properly made in the line of the tibia. A profuse discharge took place, and has continued ever since; at the present time the boy is in

a state of hectic from the effects of the discharge. Amputation, as in the former case, was performed, and with the same success.

"Mr. Liston pointed out in this case that the periosteum, where it was dissected back from the bone, was much thickened, and very vascular; that the reproduction of new bone was going on, and superseding the old in scattered portions, and in various situations. The shaft of the tibia had perished extensively, as was visible through several large cloacæ. No new bone was perceived on the outside of the periosteum, but it appeared to be deposited between the old bone and the periosteum adherent to that portion of bone which had retained its vitality. Upon looking at the superior surface of the tibia, a small circular opening was observed, communicating with the knee-joint. The whole synovial membrane was exceedingly vascular, and ulceration of the cartilage had commenced at several points. Amputation, in both cases, was rendered necessary by disease of the knee-joint succeeding to injury and inflammation of the bone; in both it was performed at the middle of the thigh."

From such or other causes, inflammatory action may be excited, and, being either overlooked or trifled with at first, may be permitted to gain head. Or from the first it may have been of a dangerous, violent, and intractable character; formation of matter cannot be prevented; the articulating cavity is expanded, lined by an adventitious membrane secreting pus, and is in fact, converted into a large abscess. The cartilage disappears by ulcerative absorption, the ends of the bones are exposed, the ligaments are softened and disorganised; the limb becomes enormously swollen, and the joint is found unusually loose,—partly from the disorganised, softened, and relaxed state of the lateral and other ligaments,—partly in consequence of the muscles being weakened and paralysed, as it were, by pain and disease. Any motion is performed with great suffering and agony; and during the attempt distinct grating of the bones, one on the other, can be perceived. Such is the progress of mischief in the large as in the smaller articulations—in the elbow or knee, and in the joints of the fingers. Disease of joints is sometimes propagated from the soft parts, from injury or morbid degeneration

of these. Abscess of the cellular tissue, or of bursæ, often leads to affection of an adjoining articulation. Also disease originally in the head of a bone may lead to affection of the cartilage and synovial membrane. But in the advanced and more serious stages of those diseases which in this volume principally demand consideration, whether in the acute or chronic form, it is often next to an impossibility to say in what tissue morbid alteration has first commenced. By a very anxious inquiry as to whether swelling existed first, or whether constant and violent pain, increased on motion, and more severe during the night, preceded the swelling, a pretty shrewd guess may be formed;—that in the former case the synovial membrane originally underwent changes, that its capillary circulation became loaded, that it became pulpy and thick, and that its secretion became more profuse and vitiated, thus accounting for the swelling; or that, in the latter, the bone was affected at the commencement, and the cartilages absorbed on one or other aspect. All this, however, will serve but little purpose, when bones, ligaments, cartilages, and synovial membrane, are equally involved in one mass of disease, as is sooner or later the case,—whichever tissue is originally affected,—if the progress of the action be not put a stop to by energetic and well-devised means, and opportunity thus afforded for the establishment and continuance of a healthy and reparative process. As the disease advances, the general system begins to suffer from constant pain and irritation. When discharge is established, and a continued drain from the circulating fluid is thus superadded, the strength and powers of the patient gradually sink. No improvement in the health can be rationally expected from the most judicious management,—certainly not from drugs or chemicals of any kind,—until the cause is in some way removed. A speedy improvement follows abatement or removal of the irritation and discharge, or any other favorable change of the local malady.

The treatment necessary to control or check disease in joints, in particular cases, demands, on the part of the practitioner, a careful and proper understanding of the various pathological changes, a nice discrimination of circumstances, and a perfect acquaintance with the effects and objects of the various thera-

peutic means. In all injuries and diseases of joints,—in the slow strumous degenerations, as well as in the most violent form of articular inflammation,—perfect quietude and repose of the affected part form the most powerful and essential means of cure; neglect them, and all other means are found nugatory, and were as well untried. Nothing but disrepute and disgrace can accrue to the profession and its professors, if hot irons, moxas, and issues, continue to be used, inconsiderately, to the neglect of more powerful and less appalling means. Instant relief invariably follows the securing a state of perfect and absolute rest; other means, local and constitutional, are thus afforded a fair chance of doing good, and the natural efforts towards a cure are no longer thwarted and interrupted. But, above all, the effect on the general health is most remarkable and cheering. Even in very complicated and bad cases,—in which sinuses communicate with the cavity of the joint, and in which the heads of the bones are ascertained to be in a state of ulceration, or partially necrosed,—the good effects of perfect quietude of the joint will soon be manifested, by cessation of the pain, diminution of the discharge, and speedy improvement of the patient's health. A cure of the local mischief by this means may not be possible, but much will often be gained, as regards the success of ulterior proceedings, by the certain amendment of the patient's condition, and the rapid change for the better.

The sudden improvement, in the health of patients worn down by the disease of a joint, can be witnessed at any time in the cases of morbus coxarius, treated on the principle here laid down, at the North London Hospital. In the first stage of the disease, during the period when there is apparent elongation, and also in the second, when ulceration has made progress and the limb is shrunk and shortened, great benefit and relief will be found to follow the adoption of this method. The joint is placed extended,—the most favorable position it can occupy, should permanent stiffness arise. A splint is applied, similar to that used by the old surgeons, composed of some soft substance, as tow and albumen,—described by Scultetus, and delineated by him even to the eggs on a platter; we use coarse soft lint soaked in a strong solution of gum acacia; it is laid on in strips

over the side and pelvis, from the short ribs to the knee, and made to embrace the limb fully. A layer of dry lint is first applied, and is followed by two or three others, soaked in the mucilage; these are covered by a fold or two of coarse calico, and the whole is retained by a roller. In cases where the limb has been retained for a long period adducted and bent, and when some little trouble and uneasiness have arisen in placing it in a favorable position, it will be advisable to preserve it so by the use of the thigh-splint, as for fracture, during some twenty or twenty-four hours, until the composition dries, and the splint has adapted itself closely to the parts.

I had occasion, very lately, to observe the good effects of this treatment in a very remarkable case, under the care of my friend Mr. Oriel, of Alfred-place, in which, from disease, what remained of the head and neck of the femur was luxated upon the pubes. Immense abscesses had previously formed, and were opened; the limb became rather suddenly everted, and slightly shortened. The luxation was easily reduced, and the apparatus here recommended applied with great relief and advantage.

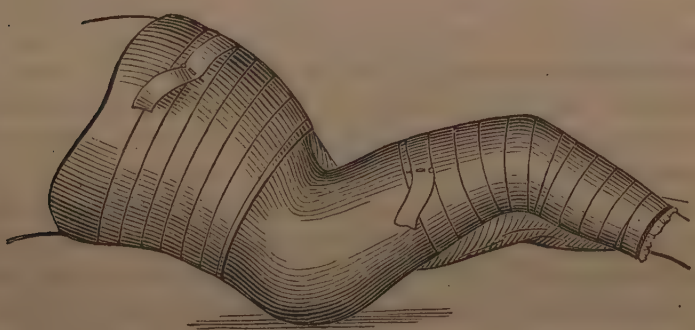
The gum splint can be made of any form, so as to allow of its being taken off, trimmed, and lined with wash-leather, or protected with a layer of oil-silk, and reapplied with a clean bandage. It can also be fashioned so as to leave any part exposed, in order to admit of dressings; the discharge from issues and abscesses can thus be allowed to escape, and the parts are attended to without disturbing the limb. Two splints can be formed instead of one; in fact, the apparatus can be varied as circumstances demand, and it is applicable in a great variety of cases, and to any articulation. A perfect mould is formed of the part, and this can be applied with any degree of tightness that is suitable and comfortable to the patient. A firm and very useful splint is, with the same view, made of leather dressed without oil, cut to a proper form, moistened in tepid water, and applied with a roller; it soon becomes firm, forming a case fitting the part accurately; it is then pared, fashioned neatly, and lined. In many chronic cases such splints answer admirably; they are readily undone and reapplied: so are the

gum splints; and the latter can be fitted with less disturbance of the limb, which, in many cases, is a great recommendation. In the acute affection of some joints—as the wrist or knee—a well-hollowed-and-fitted wooden splint will often be found useful for a time: it is retained by looped bandages. Provision having been made for the quietude of the limb, recourse must be had to such treatment as the nature and progress of the disease may demand, and the system of the patient will bear.

[The success of Dr. Physick in morbus coxarius, was so great, as to induce him to believe that he could effect a cure in all recent cases, and in many even of long standing, where the joint was not disorganized. From a paper published by Dr. Randolph, in the seventh volume of the American Journal of the Medical Sciences, we gather the following account of the treatment by which this success was arrived at. Before commencing the treatment of a case, the Doctor was careful to make the patient fully aware of the chronic nature of the complaint, and of the probable length of time which, even under favorable circumstances, would be required for a cure. If the parts about the hip were inflamed, swollen, or tender to the touch, leeches were applied, and a course of steady purging with the cream of tartar and jalap administered every other day, in sufficient doses to procure several copious evacuations, was commenced. Having pursued this treatment for some weeks, and accustomed the patient to confinement to bed, a splint, properly carved out of some light wood so as to be adapted to the size, shape and position of the diseased hip joint, thigh, knee, leg, and part of the same side of the trunk, was next applied. This splint should extend from the middle of the thorax half way down the leg, and should be wide enough to embrace nearly one half of the circumference of the parts to which it is applied. In cases in which the limb is bent either at the pelvis or knee, no attempt must be made to force the limb into a straight splint, but this must be adapted to the exact position of the limb. After a splint of this shape has been worn for some time, the inflammation subsides so much that the limb can be put in a straighter position; and now it becomes necessary to apply a second splint, which will fit the changed position of the parts. It is not often that more than two splints are required in the treatment; Dr. Physick has, however, been obliged to have recourse to three, and even four. The inside of the splint, must be carefully wadded: and it must be retained in its proper situation by means of rollers passed round the splint and limb.

The length of time required for a cure of coxalgia varies from six months to two years, though the usual period is about twelve months. During all this time the splint must be kept steadily applied, and the surgeon should not remove it until some time after all the symptoms have entirely subsided, Exercise of the limb is then to be resumed in a cautious and gradual manner. When the splint is first applied, the child is often restless, and complains so much that it sometimes becomes necessary to remove it for a short time.

This treatment is particularly adapted to morbus coxarius prior to the period of suppuration. When abscesses form and burst, it becomes necessary to apply soft poultices, and, in some instances, to support the patient's strength by gentle stimulants and a nourishing diet. The splint, however, must be regarded as the important remedy in all cases in which the head of the femur is not either destroyed by caries or pushed out of its natural socket by the disease, and even then it may lead to a cure by promoting anchylosis. The carved splint is well represented in the following cut.]



In acute inflammatory attacks, very active antiphlogistic means must be adopted, so as at once to make an impression upon and extinguish the action. The limb should be carefully placed on an elevated and inclined plane, where it may lie easily and steadily. Blood is taken from the arm, and from the neighbourhood of the part; leeches are applied in great numbers, and repeated at short intervals, if the symptoms do not

show a ready disposition to yield; a niggardly use of leeches will do more harm than good, and some dozens should be applied together, rather than in detachments. The object is to relieve the effected capillaries; fomentations will relax and keep up a determination to the surface; cold lotions, so often and inconsiderately used, have, it may be presumed, the opposite effect. Cold applications form a thorough routine system, resorted to by some practitioners,—useful in few cases, and productive of aggravation in many. Their good effects, in any case after inflammation has commenced, are very questionable, however useful they may be before the action has come on, with the view of preventing or moderating it. After the more violent symptoms have abated, a further determination and discharge from the surface will be productive of good effects. Vesication may be caused by the common cantharides plaster, by rubbing the surface externally with the nitrate of silver, or by the application for a time of strong liq. ammoniæ or acetum lyttæ; or an eruption may be brought out by friction with either croton oil, or a strong ointment of the tartrate of antimony—the strength proportioned to the age of the patient, and to the nature of the part from which it is desired to obtain a discharge.

In chronic swelling of a joint, either following an acute inflammatory attack, or coming on slowly and gradually—as a consequence or not of some slight injury,—the first object of the practitioner will be to arrest the progress of disorganisation, and prevent its attack on the cartilages and bone; he will also endeavour, by all means in his power, to promote absorption of the fluids effused into the synovial capsule and bursæ, and to bring their secreting membranes into a more healthy condition. In consequence of the advanced stage of the disease and the state of the constitution, these indications are not easily fulfilled in many of the cases which present themselves. In the more favorable instances, speedy amendment will follow the fixing of the articulation, and the application of uniform and gentle pressure. This is effected somewhat after the fashion of Mr. Scott's plastering,—which has been employed very extensively, and rather indiscriminately, to all affections of joints, and to many

swellings and pains in other parts. A great part of the process may well and safely be dispensed with,—such as the bathing with camphorated spirit, the mercurial ointment, and much of the plastering. It is advisable in the first place to give support to the lower part of the limb by a roller, up to near the affected joint; the surface should then be covered by lint, spread with some gently stimulating application—soap cerate with camphor answers well; the whole articulation is then to be surrounded and supported by long strips of plaster, crossed in various directions, and drawn with a very moderate degree of tightness, so as to give a feeling of support without occasioning uneasiness: the roller is then carried upwards over this dressing, and to some extent above the joint. In order to prevent motion of the affected parts, which would tend to keep up and increase the mischief, leather splints should be applied outside. A few dressings of this kind, at intervals, will often be followed by a most manifest improvement in the external appearance of a diseased joint, and sometimes, there is reason to believe, in its internal condition. The time for changing the plasters depends upon a variety of circumstances—as the occurrence of pain or discharge,—but more particularly on the extent to which they have slackened, thereby showing how far the swelling has subsided. Amendment of the general health follows almost as a necessary consequence of improvement in the joint, if the constitutional derangement have been merely attributable to the disease in the latter. Well-fitted splints, such as already recommended, can then be applied alone; the gentle pressure and support,—having served the purpose of promoting absorption and removing the effusion and thickening,—are no longer required, and may be dispensed with. The treatment above recommended may, in some cases, be very advantageously preceded by the local abstraction of a small quantity of blood, or by the establishment of some discharge from the surface, in order to remove any painful feelings or local excitement that may exist, and which might be aggravated by the pressure. Also, circumstances may occasionally render it necessary that the pressure and support be suspended, to give place, for a time, to antiphlogistic treatment.

When considerable subacute inflammatory swelling of the superficial parts of a joint succeeds synovial inflammation, a succession of blisters of nitrate of silver over the whole joint, succeeded by splints carefully made of thick leather, will be found most efficacious in discussing the disease. During the cure, it will be necessary to keep in view the most advantageous position of the limb, particularly when, from the duration of the disease and the probable pathological changes, there is reason to dread impairment of motion in the articulation. By gradual and steady extension,—by means of a simple wooden splint, made to fit the leg and thigh, and a common roller,—or by the use of a jointed splint and extending screw,—the knee-joint may be brought into nearly a straight position, so that it shall be serviceable in progression. By similar means the elbow may be bent, to form a right angle with the humerus. These attempts, however, must be made with great prudence and caution; and must be suspended, or at least less actively employed, if any painful feelings arise, threatening excitement of the circulation in the part, or the slighest aggravation or return of the morbid action. The progress of the cure will often be much expedited by great attention being paid to the digestive apparatus, and to the secretions and excretions from the skin and kidneys. The ejection of sordes and worms from the bowels of children should not be neglected; and, with this view, exhibition of the balsam of copaiba will answer well in many cases. Various tonics and alteratives (certainly not mercurial) will be serviceable, and must be varied as occasion requires. The alkalies, sarsaparilla, and preparations of iodine, are all useful, either separately or conjoined.

In the more painful and dangerous affections of the articulating apparatus, when there is reason to suppose that the cartilages are extensively absorbed, (whether this be a primary or a secondary affection,) and when the cancellated texture of the bone is more or less affected, good effects may yet follow judicious treatment. Here, also, the principle of preventing all motion, if well followed out, will be found most beneficial; and great relief will often be experienced from establishing a perma-

nent discharge from the neighbourhood of the diseased tissues. This can be done simply, and effectually, without causing alarm, or exciting much pain, by confining, with a piece of lint and diachylon plaster, a small bit of caustic potash on the skin near the diseased joint. After the slough has separated, the sore is dressed with any simple ointment; and when disposed to heal, is deepened, and made to discharge freely, by a few hours' application of the antimonial ointment. A seton may be preferred in some situations; certainly, discharge can thus be kept up, and derivation obtained from the affected parts, fully as well as by actual cauteries, moxas, pea issues, or other farrier-like practices. Great care must be taken in the placing of issues; they should be near, but not upon a joint. Serious results have occasionally followed their careless application. Diseased action has been increased,—the cautery having reached, or even penetrated, the synovial capsule. I write after some experience, and from cases and specimens now before me.

[Even when carefully introduced, serious results have sometimes followed the introduction of issues in the neighbourhood of joints or large venous trunks. In 1830, I witnessed a case of death from this cause at our hospital. In this instance, the issue was placed at the inner side of the leg below the knee in a limb of which the veins were in a varicose state, and was soon followed by general inflammation of the limb, and a train of violent symptoms which carried off the patient in a few days. On post mortem examination, the vena saphena was found in a high state of inflammation, and filled with pus.]

Many diseased joints, more especially in the working classes, are trifled with or neglected, until their structure is irretrievably destroyed, and until discharge, irritation, and fever, have reduced the patient to the lowest ebb. Also, disease in joints, after having gained a certain point, will sometimes produce destructive results, in spite of all that science can suggest, or art effect. Portions of the cancellated texture, which have perished, or which have been acted upon by the absorbents, and become carious, are not repaired. The dead parts must be detached. Abscess surrounds these unsound or necrosed spots, makes progress, and comes at last to the surface.

The swollen and puffy state of the parts is here well represented, with the elevated openings giving vent to copious purulent secretion, and leading to the diseased articulating ends of the bones. The disease in the deeper parts is, at the same time, necessarily aggravated. Grating of the articulating extremities is felt on motion, as may be easily understood from an inspection of such specimens as those from which the annexed sketch is made. The joint is loose,—can be moved laterally, in an unnatural manner,—and the limb is often found to be a little longer than natural. This arises, as has been already stated, from the laxity of the lateral and other ligaments, and the weakened and almost paralytic state of the muscles, which, in the normal and healthy state, keep the articulating surfaces in close contact. Gelatinous effusion takes place betwixt the fibres of the lateral ligaments; they become soft and swollen; perhaps a probe can be passed into the cavity. Cure by anchylosis is not impossible or unfrequent, when circumstances favour it, even after extensive ulceration of the cartilages and surface of the bone has taken place. Anchylosis is much favoured by due attention to the

patient's health, by change of air, sea-bathing, &c.—and more especially by careful and firm fixation of the limb by leather splints. As long as the patient's health is pretty good, he is not hectic, has a good appetite, and does not fall away in flesh, we are warranted in delaying an operation, although we may have every reason to believe that the greater part of the articulating apparatus of a joint is destroyed. But the existence of carious cavities, or of necrosed portions,—perhaps a combination of both,—will very frequently forbid any hope of benefiting the patient, unless by operative procedure. His health must go on declining, and his lungs will ultimately suffer. In consequence, recourse must often be had to amputation of the member, in order to save life; and it is surely better, in these cases, as Dionis has well remarked, that the patient should prefer the chance of living with three members, than the certainty of dying with four. The amputations are described *seriatim* in Chap. X. The surgeon must of course be fully impressed with the absolute necessity and propriety of such a proceeding, before he proposes mutilation. He is justified in this course only when the structure of a part is destroyed throughout, and when it can be no longer useful; when, from immobility and awkward position, a limb, or a portion of it, proves an encumbrance; when the retaining of an injured or diseased part must lead certainly to dangerous consequences, such as contamination of the system, and deterioration of the health and strength, by which the duration of life must inevitably be shortened.

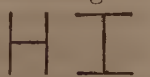
RESECTION OF BONES.

Extremities can occasionally be saved by removal of the diseased portions of bone. Irregular operations for this purpose—for conducting which no rule can be laid down—may be performed in all situations. I have made incisions on the heads of the bones of the metacarpus and carpus; on those entering into the composition of the ankle-joint; on the tarsal bones, the cuboid, calcaneum, &c.,—and successfully removed dead or diseased portions; the wounds have been kept open until healthy granulations have filled up the cavity, and coalesced with the soft parts. Various escharotics have been used to get rid of

unsound portions of bone, of which perhaps the best and most manageable is the red oxyde of mercury. A firm, white, depressed and adherent scar,—indicative of its permanent nature, has resulted in a great many of these cases, and the patient has had the use of the part as well as his general health, restored. Some articulations are so situated, as regards the soft parts, that they can be got at without difficulty, and the ends of the bones forming them are readily enough removed. Such operations may be resorted to with propriety, when the patient's general health has not suffered much; or when, from keeping the joint in a state of quietude, the discharge has abated, and the system recovered from the effects of the irritation and constant drain. When, however, the soft parts are much diseased, when, as is often the case, the disease is not limited to the articulating surfaces, or when the patient is reduced to a very low state by hectic, it may not be very prudent to try the experiment; for it has happened that, after all, the proceeding has not been followed by removal of the whole disease, or subsidence of the constitutional disturbance; and, in the end, amputation has been deemed advisable. And this latter operation, which alone, and in the first instance, might have been borne up against, has, in that stage, been followed by a fatal result.

The elbow-joint is the one, of all others, on which excision, or resection, as it has been called, may be had recourse to with the best prospect of a successful issue. The bones are thinly covered on one aspect, and can be reached without risk of wounding any parts of great importance. It is highly desirable, in many cases, to preserve the hand, even though no very powerful use can be made of it; and unless the operation on the elbow be performed when the person is very young, and the portion of bone removed be very small, the motions of that joint must of necessity be ever after very weak and unsteady. In the operations which I have performed on the adult, amounting in all to six, for thorough removal of the ends of all the three bones, I have aimed at bringing about a kind of ligamentous anchylosis, by steadying the part for a long time by means of leathern splints. In fact, the patient, in order to use the forearm and hand to any advantage, will require to have some per-

manent contrivance to fix the fore-arm at a right angle with the upper-arm. In young patients, on the contrary, as I know from experience, the motions of the part may be encouraged, with every chance of their ultimately becoming tolerably free and strong.

. The involvement of the bones in disease, and its extent, having been ascertained by the careful use of a probe,—and circumstances being favorable for their removal,—the plan must be well considered, and the necessary instruments got in readiness; these consist of a strong, sharp-pointed, broad bistoury, an amputating saw, a small narrow saw without a back, a copper spatula, cutting forceps, dissecting forceps, tenaculum, hooks blunt and sharp, suture needles, and ligatures. The patient is placed prone on a table, or, which is better, he is seated in a chair, with his back to the operator; an assistant holds the hand and fore-arm, and preserves it extended, whilst another prevents the patient from turning round. The incisions may be variously planned, so as to form flaps, the raising of which shall expose the joint fully. The forms  have been followed; latterly, I have preferred the more simple one An incision is made on the radial side of the ulnar nerve, and in the direction of the limb, by pushing the point of the knife through the integument and fibres of the triceps to the back of the humerus, and carrying it downwards in contact with the ends of that bone and of the ulna for about three inches; another, commencing over the outer condyle of the humerus, and penetrating the articulation, is made to fall on the middle of this, at right angles, the two flaps are reverted by a few strokes of the knife, and the soft parts, along with the nerve, are turned over the inner condyle; the ends of the bones, but slightly retained by their ligaments, are turned out of the wound by flexing the fore-arm; the soft parts are detached, as much as is necessary, by cutting upon and close to the bones; the extent of ulceration or necrosis is then well ascertained, and, by the application of the saw, the unsound parts are removed. During the cutting of the bone, the copper spatula

may be of use in protecting the nerve and other soft parts. A partial anchylosis will occasionally be found to have formed, and then the small saw or cutting-forceps may be called for. In operating upon young patients, the forceps may sometimes be used in preference to the saw, the bones being soft, and extensive removal not being demanded. After the operation is concluded, the clots are cleared away, and perhaps an arterial twig or two may require ligature. The hook, or tenaculum,—or spring-forceps with points, similar to Assalini's tenaculum, delineated at p. 18,—will be found to answer better than the dissecting-forceps, in dealing with vessels in condensed parts. The further extremities of the incisions may be brought together by three points of uninterrupted suture, and the size of the wound thus abridged; the middle, where the incisions meet, must, of course, heal by the second intention; wet lint is applied over the whole wound for some hours; a few strips of plaster are then put upon the space beyond the sutures; these are soon cut out, and the opening over the joint is treated with the tepid water-dressing. After a week or two, the limb,—which has been kept on a pillow, half bent,—is secured in splints, and supported in a sling; when the wound has healed, the motions of the fore-arm and hand should be encouraged. The arm may require to be supported by an angular leather splint above and below the elbow joint, for some time after the diseased bones are removed; and with this apparatus the motions of the hand are very perfect. In more favorable cases the patient will acquire very considerable power of motion in the false joint. He will be able to straighten and flex the arm almost as completely as before the operation. The union in these cases is not usually effected by anchylosis, but a dense fibrous tissue passes between the ends of the bones at all parts, and the whole is surrounded by strong ligamentous substance to which the muscles are inseparably united. The fibrous tissue between the bones is longer or shorter, as more or less motion is permitted.

The shoulder-joint may be made the subject of a similar operation, but the necessity for it does not so often arise. The head of the humerus, shattered by gun-shot, without great injury of

the soft parts, may be cut upon and excised; amputation of the limb may thus be avoided. The articulation is the seat of disease named omalgia, and this terminates occasionally in deep ulceration of the head of the humerus, as well as of the articulating process of the scapula; the shoulder and upper arm are noticed to waste, and the motions are weak; on examination it is found that the patient has great pain when the joint is moved, and when the surface of the bones are brought into contact. In a more advanced stage, abscess forms, and a probe reaches the joint; the health declines; and hectic and consumption carry off the patient. The head of the humerus can be removed with great facility, and even diseased portions of the scapula can be reached for this purpose; the position of the openings may perhaps somewhat determine the line of incision; it may be made from the point of the acromion, through and near to the insertion of the deltoid, or it may course along the posterior border of that muscle. More room is gained for the completion of this operation by making an incision from the point of the acromion three inches down the arm, through the fibres of the deltoid, and another incision outwards from the termination of the first one to the posterior border of the muscle; the triangular flap is reflected upwards and outwards, and the joint thus fully and easily exposed; the joint is reached at once, and by carrying the arm across the chest, and raising the elbow, the head of the humerus is protruded and examined, and so much as is in an unsound condition is taken away by the application of the saw; the mode of using the instrument is treated of in Chap. X. The edges of the wound, which should be free, are held aside by bent copper spatula; the glenoid cavity is looked to, and, if unsound, as is usually the case, its neck is embraced by a pair of large cross-cutting bone-nippers, and so taken off; the upper part of the wound is put together at a proper time and in the right way, as described in Chap. II.; space is left at the lower corner for the escape of discharge, and the limb is kept very quiet and steady for a considerable time. After the removal of the head of the humerus, complete motion is permitted in every direction—the arm cannot be raised by the efforts of its own muscles above the head, but, by grasping a stick in the two hands, the imperfect

arm can be readily elevated as high as the other one. Resection is scarcely applicable to other joints; it has been attempted on the knee, but with no encouraging result. My old pupil and friend Professor Syme, of Edinburgh, has the merit of directing, by his writings, the attention of the profession in this country to this important and interesting subject.

[The cure of injuries and inflammatory affections about the joints is not unfrequently followed by anchylosis, or a partial or entire loss of motion in the part. This state is caused either by rigidity in the ligaments, muscles, and other soft parts that surround an articulation, or by a firm union between the articulating extremities of the bones. Often the rigidity of the joints is accompanied by a bad direction and great consequent deformity of the limbs, which the surgeon may be called upon to obviate, as well as to restore to the articulation the movements which it has lost. When recent, false or incomplete anchylosis can generally be overcome by frequent and careful motion of the limb, conjoined with the use of frictions and gently stimulating embrocations. But when it is ancient, and attended with strong contraction of the flexor muscles about the joint, restoration is mostly impossible, and all attempts at motion, however carefully made, cause extreme pain, and may give rise to a renewal of the inflammatory action. The deformity accompanying such cases is often extreme, and all support from the limb, if it be a knee which is affected, as is most frequently the case, is lost, and the patient has hitherto been condemned to move about with a crutch, or other artificial support. A mode of cure for the deformity attendant upon such cases has, however, of late years, been devised and often executed, which consists in the section of the tendons of the biceps, crural, semi-membranosus and semi-tendinosus muscles; and though it may be questioned whether the rage for tendon cutting has not been carried much too far in contractions of the knee, as it certainly has in the treatment of club-foot and other deformities, and whether equally favorable results might not be attained with nearly like rapidity, less danger, and as much permanent benefit, by well devised and applied machinery, still it is undoubted that in some instances, much success has followed the practice.

True anchylosis has been generally looked upon as incurable, but the successful results of two highly ingenious and original operations for the relief of anchylosis of the hip and knee joints, attended with great deformity, devised by our townsman, Dr. J. Rhea Barton, are sufficient to prove that, in some instances, even this may be cured. The subject of Dr. Barton's first ope-

ration was a sailor, 21 years of age, who received an injury by a fall from the hatchway into the ship's hold, a distance of six or seven feet, the force of which was sustained on the outside of his right hip. Violent pain, great tumefaction and loss of power over the limb, ensued. After his accident, he placed himself on his side, with the injured limb uppermost, drawing the thigh to a right angle with the axis of the pelvis, and the knee resting on the sound side. In this posture he continued for the space of five months, enduring, at the same time, all the suffering attendant upon a high degree of inflammation of the joint. Seven months after the accident he came to Philadelphia, and placed himself under the care of Dr. B. At this period he was supported by crutches, had the thigh drawn up nearly to a right angle with the axis of the pelvis, and the knee turned inward and projecting over the sound thigh; so that the outside of the foot presented forward. The swelling about the hip, and length of time which had elapsed since the receipt of his accident, made it impossible to ascertain the exact nature of the injury, though Dr. B. was inclined to think that it had been a severe contusion of the joint, and that disorganisation had followed the consequent inflammation, producing true anchylosis. To test this, the patient was admitted into the Pennsylvania Hospital, and means to extend the limb were employed for some weeks, in hopes that its mal-position might be corrected. This treatment, however, only proved the unalterable state of the hip-joint, and confirmed Dr. B. in his early-formed opinion. Much reflection on the case led the doctor to propose to his colleagues the following operation, viz:—"To make an incision through the integuments of six or seven inches in length, one half extending above and the other below the great trochanter; this to be met by a transverse section of four or five inches in extent, the two forming a crucial incision, the four angles of which were to meet opposite to the most prominent point of the great trochanter; then to detach the fascia, and, by turning the blade of the scalpel sideways, to separate, anteriorly, all the muscular structure from the bone, without unnecessarily dividing their fibres. Having done this in like manner behind and between the two trochanters, to divide the bone transversely through the great trochanter, and part of the neck of the bone, by means of a strong and narrow saw, made for the purpose; this being accomplished, to extend the limb and dress the wound. After the irritation from the operation shall have passed away, to prevent, if possible, by gentle and daily movement of the limb, &c., the formation of bony union, and to establish an attachment by ligament only, as in cases of ununited fractures, or artificial joints, as they are called."

On the 22d of November, 1826, this operation was put into effect. Not one blood vessel required to be secured. Union by the first intention was not attempted, and the patient was put to bed and Desault's splints applied, in order to support the limb.

After the twentieth day from the operation, the limb was cautiously moved in such directions as resembled the natural movement of the sound hip-joint; but care was taken not to use any violence, or to continue it so long as to give rise to any permanent irritation.

In the course of a short time afterwards the patient daily exerted his muscles in slightly flexing, extending, and rotating the thigh. This he accomplished without difficulty, and, after a little practice, without pain. Sixty days after the operation the wound had entirely healed, and all traces of inflammation had disappeared: he now, with careful assistance, left his bed, and, aided by crutches, stood erect, both feet reaching the floor; and was able to advance his leg exclusively by muscular exertion; and while resting on the sound side, could rotate his knee without pain.

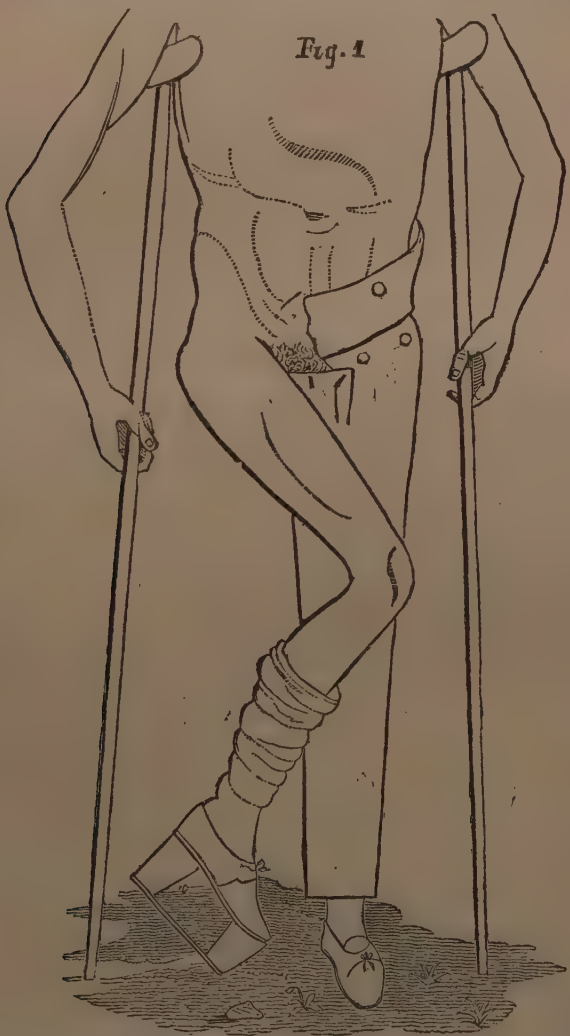
Seventy days after the operation the patient walked, with the assistance of his crutches, a distance of about one hundred and fifty feet, and had, by this time, regained every movement which the limb originally possessed.

Four months after the operation no restriction to the movements of the joint existed; the degree of motion was more limited than that of a natural articulation at the hip, but was, with slight aid of the spinal column, adequate to its various offices. (See North American Medical and Surgical Journal, April 1827.)

The subject of the operation enjoyed the use of his artificial joint for six years. After this period he fell into habits of intemperance. This, with its attendant evils, want of care and repeated injuries to the part from falls, &c., caused it to become more rigid, and gradually all motion in the part ceased. With this exception, the benefits of the operation were retained until the period of his death, the limb being freed from deformity and restored to a useful position, so that he had no occasion even for a cane to aid in walking. He died of phthisis pulmonalis in 1833; and, to show his gratitude to his surgeon, bequeathed to him the parts interested in the operation.

The same principles that governed Dr. Barton in this operation, are, he thinks, applicable to the formation of new joints in other parts of the body where natural motion has been lost. The hip, knee, shoulder, elbow, great toe, and finger joints, and lower jaw, may all come within the reach of amendment by an

operation, if the muscles which move these respective joints are in a sound state. If they have been lost it would be wrong to form a joint, since its unrestrained motion would be more troublesome than a rigid limb. A transverse section of the bones would be proper if the operation was to be performed at the shoulder, fingers, or toes; but an angular division would be necessary at the elbow, in order to preserve some resemblance to the natural joint at this part. In the accompanying cuts, a sketch of an anchylosed elbow, in the straight and angular posi-



tion, and the manner in which the section would be most advantageously made, is given.

Fig. 1 represents the condition of the patient previous to the operation. It will be observed that the distortion of the limb was so great that the cripple's shoe, which he wore, did not supersede the necessity for crutches; but that its tip only reached the ground, when the ankle was extended.

Fig. 2 is explanatory of the alterations in the bony structure, first by disease, and subsequently by the operation.

a, Two faint lines, representing the direction of the femur, in correspondence with the thigh, in fig. 1.

b, The head of the femur and acetabulum; all motion between them arrested by anchylosis.

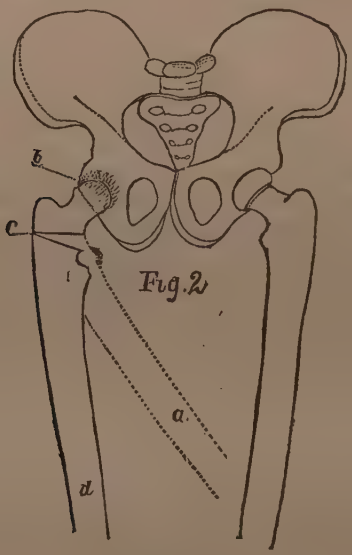
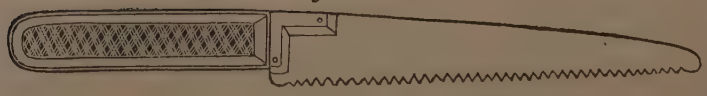


Fig. 2

Fig. 3



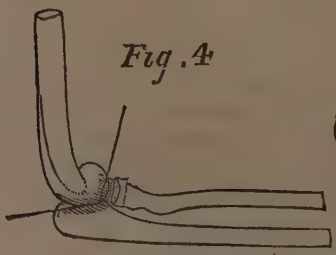


Fig. 4

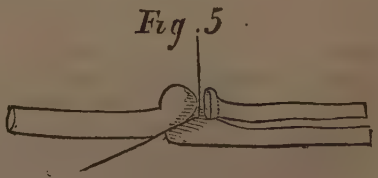


Fig. 5

c, The point at which the bone was transversely sawn through, and the triangular gap at the section, occasioned by bringing down the thigh.

d, The femur, restored to its natural position, after the separation of the bone.

Fig. 3. The saw used for dividing the bone; the blade about six or seven inches in length, and thinner on the back than on the edge; the end smoothly rounded off, to avoid piercing parts before it; teeth widely set.

Fig. 4. The elbow joint anchylosed at a right angle; the line represents the direction in which the bones might be divided by a long and narrow saw.

Fig. 5. Anchylosis of the elbow-joint, with the bones in a straight line showing the manner in which the section might be made when the limb was thus fixed.

In the second case, no attempt was made to establish an artificial joint, the object being only to remove deformity, and to restore to usefulness a limb which had been suffered to become anchylosed in a bad position. The patient, when nine years of age, had his knee-joint attacked by inflammation, which terminated in complete destruction of every structure appertaining to the joint. From this he finally recovered with the loss of the joint—the tibia, femur, and patella, being completely united to each other.

The loss of the articulation, however, did not constitute the sadness of the case. It was caused by the mal-position of the limb, the leg having been flexed upon the thigh to a degree somewhat less than a right angle. This condition of the limb, the patient (himself a medical man) endured during a period of sixteen years, when he came to Philadelphia for relief. Dr. Barton found him prepared to learn that if he could be relieved it must be by some novel expedient and treatment. After a candid and full disclosure of his views of the case, and the means by which he thought he might be benefited, the patient, believing in the feasibility of the plans, became urgent for the undertaking. It was accordingly commenced on the 27th day of May, 1835, as follows:—"Two incisions were made over the femur, just above the patella. The first commenced at a point opposite the upper and anterior margin of the external condyle of the femur, and, passing obliquely across the front of the thigh, terminated on the inner side. The second incision commenced, also, on the outer side, about two and a half inches above the first, and passing, likewise, obliquely across the thigh, terminated with the other in an acute angle. By these incisions were divided the integuments, the tendon of the extensor muscle of the leg, at its insertion into the upper part of the patella, and some of the contiguous fibres of the rectus and

cruræus muscles themselves, a greater part of the vastus internus, and a portion of the vastus externus muscles. A flap, composed, therefore, of this structure, was elevated from the femur close to the condyles. The soft parts were next detached from the outer side of the bone, from the base of the flap towards the ham, by passing a knife over the circumference of it, so as to admit the use of a saw. The flap then being turned aside, a triangular or wedge-like piece of the femur was easily removed by means of a small narrow-bladed saw, such as was used in the operation at the hip. This wedge of bone did not include the entire diameter of the femur at the point of section; so that a few lines of the posterior portion of the shaft of the bone remained yet undivided. By slightly inclining the leg backward, these yielded, and the solution was completed. This mode of effecting lesion of the bone was designedly adopted, and constituted what I conceived to be a very important measure in the operation. Important, because it rendered the popliteal artery free from the danger of being wounded by the action of the saw, and subsequently the interlocking of the fractured surfaces tended to retain the extremities of the divided bone in their positions until the harshness of their surfaces had been overcome either by the absorption of their angles or by the deposition of new matter upon them—a change essential to the safety of the artery during the subsequent treatment of the case."

Not a blood-vessel was opened which required a ligature. The wound was lightly dressed, and the patient placed on his back, with the limb supported upon a splint *of an angle corresponding to that of the knee previous to the operation.* This position was maintained until the asperities of the bone had become blunted, in order that their pressure might not cause ulceration of the artery. The first splint was then removed, and another, having the angle slightly obtuse, was substituted. In a few days a third splint, with the angle still more obtuse, was applied; and others, varying in degrees of angularity, were, in like manner, made use of, until the limb was brought into almost a straight position. It was then unchangeably continued in that line until the bone had become firmly united.

During the treatment of the case, all pressure on the soft parts in the ham was carefully avoided, in order to protect the popliteal vessels against any encroachment upon them. With this view the limb was rested on two long bran bags, laid upon the splint, with their ends apart, a vacancy of four or five inches being left between them, opposite the lesion of the bone, which was lightly filled with carded cotton.

Two months elapsed during the accomplishment of the straightening of the limb, and two months longer were required for the completion of firm reunion of the bone. The constitu-

tional symptoms were such as usually occur in compound fractures, and were at no time alarming. At the end of four months from the date of the operation, the patient stood erect, with his feet in their natural position, and the heels resting alike upon the floor, although a slight angle had been designedly left at the knee, in order that there might not be any necessity for throwing the limb out from the body, in the act of walking, which is always the case when the knee is quite straight. A letter from the patient, dated November 6th, 1837, is appended to the case, in which, after stating that the operation had been completely successful, and that, during the summer, he had been riding from thirty to fifty miles a day, in attending to his professional business, he says; "I feel no other inconvenience in riding or walking than what arises from my knee joint being stiff, which was the case before the operation. I walk without a stick, or other aid, with the sole of the foot to the ground, and, my friends tell me, with but a slight limp: and I have great pleasure in adding that the leg and foot have increased considerably in size, so as now to be nearly equal to the other."

The accompanying cut will serve to illustrate the above operation.

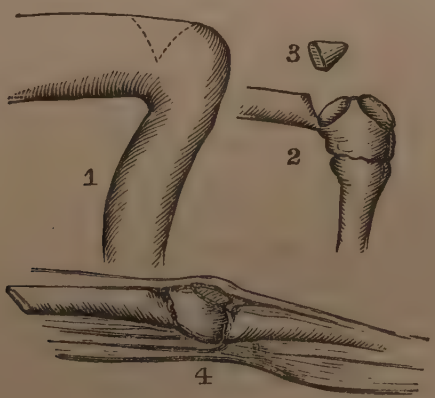


Fig. 1 shows the situation of the flap just above the knee.

Fig. 2 shows the operation on the femur.

Fig. 3. The piece of bone removed.

Fig. 4. The manner in which the gap in the bone, as represented in fig. 2, was closed by the overlapping of the surfaces consequent to the extension of the leg. These uniting, restored the integrity of the limb. (American Journal of the Medical Sciences for February, 1838.)

An operation very similar to, and suggested by that of Dr.

Barton, for anchylosis of the hip-joint, was performed by Dr. J. Kearney Rodgers, of N. York, in 1830, the particulars of which have been published during the past year. By an accident received thirteen months previous to the operation, the patient, æt. 47, had fractured his left thigh near its middle, and received a severe contusion of the right hip-joint. From faulty adjustment of the apparatus employed, shortening of the left limb to the extent of two inches occurred, and the inflammation of the right hip consequent upon the contusion, proved very severe, and terminated in complete bony anchylosis. At the date of the operation he could walk, though with a painful effort, and the knees, in the act of progression were separated two feet and a half.

Dr. Rodgers proposed for the relief of this deformity, "to cut down to the os femoris; saw it off immediately above the small trochanter, and as this limb was two inches longer than the other, to remove as much as possible of the bone between the trochanter and the head, so as to make the two limbs as nearly as possible of the same length." The patient consenting, the operation was done on the 24th of November, with less difficulty than had been anticipated, and a wedge-shaped portion of the bone removed, the thickness of which at the outer part was nearly half an inch, and at the trochanter three quarters of an inch. The wound was dressed with adhesive plaster and lint, and the limb was kept in a proper position by a bandage to the feet. Passive motion of the part was commenced and kept up daily six weeks after the operation, and by the 1st of March the wound had healed. In May 1833, he was last seen by his surgeon, at which time he walked well, assisted by a cane—could rotate the right limb inward and outward; abduct it, and flex it nearly to a right angle.

The second operation of Dr. Barton spoken of, viz., that for the removal of the deformity consequent upon angular anchylosis of the knee-joint, has been repeated by Prof. Gibson, at the Blockley Hospital, and the patient, a healthy negro, aged 19, at the time of these sheets passing through the press, ten days after the operation, was in every respect doing well.]

CHAPTER V.

ON INJURIES AND DISEASES OF MUSCLES AND TENDONS.

Division of muscular fibres is followed by immediate retraction towards their fixed points, and by that of the tissues connected with them. This injury is often produced accidentally; sometimes it is inflicted by premeditation, but it is the aim of the surgeon, in the greater number of cases, to avoid cutting across muscular fibres; and division of the super-imposed parts, not in the direction of the fibre, is very often a serious error. The division is either simple, as when, during some sudden exertion, a muscle or part of it gives way in its sheath, or is torn from its tendon, whilst in action; or compound, when it is occasioned by violence applied from without. Wound of the integument, sometimes, however, accompanies laceration of fascia and muscular fibres, from sudden and extreme bending of a limb. I have seen two such accidents on the fore-part of the thigh; one in an old man who had long laboured under a stiffness of the joint, the other in a very active and handsome young lady. Division of muscular fibres to a considerable extent frequently follows external injury, the skin, though bruised, remaining undivided; and solution of their continuity also takes place without either external wound or external violence, in the same way as many simple fractures are occasioned. The muscles which most frequently give way from violent action, are the gastro-cnemius, the biceps flexor-cubiti, and the extensors of the leg; rupture of the first is common enough, and of the second I have witnessed several examples; the third rarely suffers, so far as I am aware. Sir A. Cooper has alluded to two cases,

however, and some time ago I saw a very complete separation of the quadriceps from its tendon. It occurred in the person of an old servant, who was descending to the cellar, carrying several bottles of wine, both hands being occupied; he suddenly felt both his feet slipping from under him, and during a violent effort to prevent falling backwards, the injury took place. The separation may be partial or complete; it is followed by sudden pain in the part, and by instant loss of power of extension or flexion, according to the situation of the injury. A void can be felt when the attachments of the muscle are removed from each other; but the space is soon filled up by coagulum, and, generally, considerable extravasation occupies the surrounding cellular tissue. The larger tendons are occasionally torn asunder; the ligament of the patella, as I have stated in the last chapter, is torn, though very rarely, so as to admit of the ascent of the bone. The tendo achillis snaps asunder at times, during powerful extension of the foot, and this is not to be marvelled at, considering the tremendous strain it suffers in raising the body.

The second Professor Monro was the subject of this accident, and has described his own case and the treatment he adopted. A still more distinguished man in our profession, John Hunter, ruptured his tendo achillis. The accident rarely happens to young persons whose muscles are in constant and full play. It is unknown amongst the athletæ who exhibit in our ampitheatres, who raise their bodies, even without the assistance of spring boards, to an amazing height and distance in the air, and who support and move under immense weights. It is an accident that most frequently occurs to those who have been for a time unaccustomed to violent action of the muscles; it happens to gentlemen of mature years, who, forgetting these, join in the sports of youth, attempting to skip and dance, as they were wont to do; suddenly they suppose that some one has inflicted a blow on the leg from behind,—their dancing is arrested, the foot cannot be extended, and the nature of the case is forthwith apparent to the most careless observer. Solution of continuity in muscles and tendons is readily repaired when these are favorably placed; the blood is absorbed; new matter is deposited, becomes organised, and is speedily converted into a substance

somewhat resembling the original tissue, from the vessels of which it has been secreted; there is a degree of thickening around, a kind of knot, for a considerable time, but this gradually disappears, and the limb regains its natural shape and use. The smaller the space allowed betwixt the divided surfaces, the less will be the plastic effusion, and the more perfect the cure. By mal-position union may be rendered imperfect and weak, or may be entirely prevented.

The principle of preserving the injured part perfectly at rest, with the muscle or muscles interested in the injury in a state of relaxation, requires to be kept in view and fully acted up to; for instance, in rupture of the biceps or its tendon, the elbow is bent, the arm carried in a sling, and this position secured by the application of a splint of wood, leather, or pasteboard, as may be most convenient. Time must be given (six or eight weeks) for firm union, before even passive motion is permitted. The leg is to be placed and preserved in the same position as that recommended for fractured patella, when by any chance lesion of the quadriceps femoris has occurred. When any part of the extending apparatus of the foot has unfortunately given way, the mode of treatment exhibited in the annexed sketch must be adopted. The means by which the end is perfectly attained cannot be rendered more simple; the whole apparatus consists of a slipper, a piece of strong cord, and a broad ring like a watch-dog's collar, the last either jointed or in two parts, connected by studs.

The muscles or tendons are not the seat of any pathological changes requiring surgical interference; they become wasted

and stiffened from inaction, after injuries or inflammatory action, and are often restored by being again put into play, by friction, passive motion, and various exercises. Minute cysts, containing a small animalcule, (trichina spiralis,) have sometimes been seen in the muscles of subjects in the dissecting-room, but it does not appear that during life any signs are presented denoting the existence of these. Muscular parts are occasionally involved in disease, commencing in the tissues with which they are connected, or in whose vicinity they are placed. In some diseases of bones and joints they are displaced, and sometimes morbidly affected. They are separated from their connexions by formations of matter; and sometimes they are destroyed, as in psoas abscess, by the long-continued pressure of pus. In evacuating collections, as in the abdominal parietes, care must be taken not to injure these parts still further; the direction of their fibres is to be considered, and the incision scrupulously made to correspond.

I had once occasion to remove the sterno-mastoid muscle of one side, involved in a sarcomatous tumour from its origin to its insertion,—a growth to which the most fastidious critic will not refuse the term sarcoma, though, in all probability, the muscular fibres may have been involved secondarily. The tumour was so far limited by a cellular sheath, yet the dissection was difficult and extensive. The patient made a good recovery, and no mal-position of the head followed. It is probable that the trapezius of the opposite side had done the duty of the diseased muscle, for a considerable time before its removal.

Operations have been proposed and practised on muscles for the removal of deformity, and often very unnecessarily; that for wry-neck,—torticollis, as it was called,—is now almost abandoned, the distortion, in general, not arising from any inherent vice, shortening, or marked contraction of the sternomastoid. Instruments were contrived for the purpose of dividing the muscle close to its origin, and, for aught we know, may be reinvented in this improving age. This operation may in some rare cases, afford facility in putting the head straight. Some time since, I saw a case in which great distortion arose from

contraction in one of the mastoid muscles, caused by bad habit; the young woman had labored under a painful ulcer of the neck, and was in the habit of keeping the head on one side, in order to relax the affected part and procure ease from suffering. Division of the muscle was advised, but not agreed to. I performed this operation, lately, with very good effect in a most obstinate case of torticollis, and it very much accelerated the benefit of the instruments afterwards applied. I have also divided the sterno-mastoid in a man, who had a very large bronchocele involving the left side of the thyroid body. It projected under the muscle, which was very tightly stretched over it, and by preventing the tumour passing outwards, pressed it upon the windpipe, causing a curvature of this tube with displacement to the right side, and great difficulty of breathing. The symptoms were much relieved by the operation, and the tube rendered straight.

The operation is performed, without any external deformity, by making a small opening in the skin, opposite the cellular space between the clavicular and sternal attachments of the sterno-mastoid. A large needle of the same shape as those used in dividing the tendo achillis is passed through the opening under the muscle, and the sternal attachment first divided, and afterwards the clavicular: if any difficulty is experienced with the needle, a curved director may be pushed under the muscle, and the fibres divided with a probe-pointed bistoury. A considerable degree of venous hemorrhage may occur, but this soon subsides when the patient ceases his struggles or cries.

It has been proposed to divide the palmar aponeurosis in some contractions of the hands and fingers, a very troublesome affection, attended, in an advanced stage, with almost total immobility of the organ. Some years ago, I had recourse to the operation in several cases; but the relief was only temporary. In many of the cases, as I have ascertained by careful dissection, the contraction does not arise so much from disease in the aponeurosis, as from rigidity of the articulating apparatus of the phalanges, change in the form of the end of the bones, and a partial ligamentous anchylosis. It is either a primary or a

secondary affection: and when it exists, neither cutting of the fascia, nor division of the muscles inserted into it, can be expected to prove in any way beneficial.

Contractions of various muscles in the body take place at different periods of life, and may produce either permanent deformity requiring operation, or may be relieved by removal of the cause giving rise to the contractions. In early infancy, from teething and convulsions, contractions of the tendo achillis, or ham-string muscles, may be produced, and which may continue unrelieved, causing future deformity. During childhood, the irritation of worms in the intestines will give rise to the same inconvenience; and occasionally, without any palpable cause, a spasmodic contraction of the muscles of the ham may take place, which will continue for some time, and yield to cupping and blistering the surface over the affected muscles.

Division of the tendo achillis has, of late, been resorted to in cases of rigidity and shortening of the muscles inserted into it, causing permanent extension of the foot, and consequent lameness.

The operation is a very simple one, and unattended with much pain or danger: a narrow knife, or the lancet-shaped exploring needle, is introduced obliquely through the skin, at a little distance from the outer or inner side of the tendon; and by directing the edge against the resisting fibres,—the foot being kept powerfully extended by an assistant,—the object can be effected with scarcely a perceptible external wound, and with the escape of only a drop or two of blood. Delpech, who practised the operation in 1816, made a free preliminary division of the integuments; others have done the same, intentionally or not. The ends are kept sufficiently asunder to admit of the proper position of the foot; and this is preserved, by mechanical contrivance, until the cure is completed by the filling up and consolidation of the void. The apparatus may, in the first instance, consist of a cord or strap attached to the point of the shoe and secured to a band on the fore part of the thigh, passed round the limb immediately above the knee; afterwards, a couple of steel rods will be found necessary, attached to the shoe,

with a strap across the instep, and another to secure them to the leg below the knee, and these must be worn for a considerable period; the position is exactly the reverse of that maintained for the cure of the rupture or accidental wound of the tendon. In the one case, the tendon is of its proper length, and union without elongation, is desired; in the other, it is desirable that new matter should be deposited to some extent, so as to produce elongation, as in a similar operation on the flexor tendons of the horse; this occurs to the extent of some inches after the operations of veterinary surgeons, and the new matter is strong and fibrous,—more interwoven and condensed, however, than the original tissue. Some continental surgeons, who have practised the operation extensively, divide the tendon, allow time for its reunion, and then apply extension, so as to elongate as far as possible the new and still plastic material by which the union is effected. The operation has also been proposed and adopted, in some cases, as a means of remedying deformity in the common club-foot, or varus.

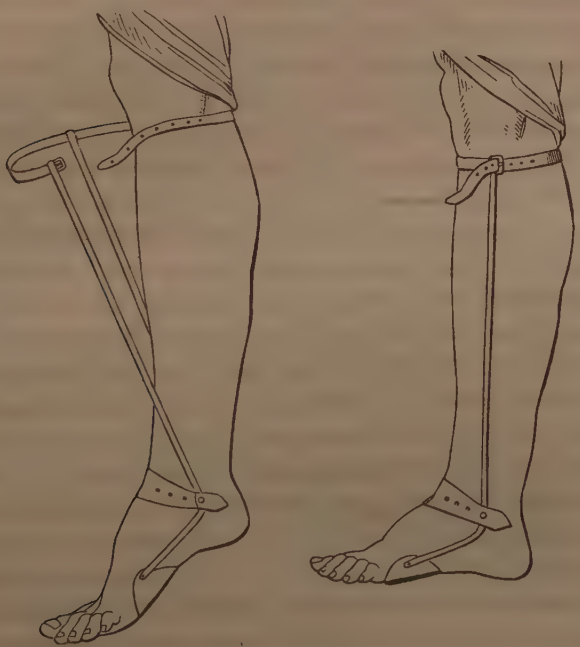
In many of these cases, the fault is not altogether in the tendons or muscles; the bones are, in the first instance, perfectly enough formed, but are somewhat displaced as regards their articulating surfaces. The ends of the tibia and fibula rest partly on, and are articulated with, the upper and inner aspect of the os calcis. The astragalus is thrown forwards, the os naviculare and the cuneiform bones are compressed and slightly altered in form, and the cuboid is pressed down upon the plantar aspect of the calcaneum.

During infancy, the mal-position can be remedied by very simple means, the parts being all pliable. The curvature of the tarsus and metatarsus inwards can be readily effaced; and even a pasteboard or leather splint, secured with adhesive plaster,—or, what is better, a splint for the purpose, to be had of all the bandage-makers,—will have the effect of bringing the foot into a natural and useful shape, if worn perseveringly, before the patient has rested on the limb. In confirmed cases, and in fact at any period, cure of the deformity will be more certainly and readily effected after division of the tendo achillis, which has

become shortened and accommodated to the mal-position of the parts; all obstacle to depression of the heel will thus be done away with. If muscles and tendons are to blame for this abnormal position of the foot, the tibialis posticus and flexor longus pollicis, as also the plantar aponeurosis, should not escape observation, but these cannot be so easily or safely interfered with. The rudiments of all the bones are present, and what is wanted is merely a favorable position during their growth, to cause their natural developement. If the awkward position, however, is allowed to remain until ossification has advanced considerably, then of course the difficulties of the case will be increased. The bones are fashioned to each other, become fixed in their relations, and are much altered in shape and size: the os calcis, more especially, is shortened; and provision is made for the unnatural bearing of the foot in its outer side, by the formation of a cushion of fat, thickened cuticle, and a large synovial pouch, over the end of the cuboid and metatarsal bones of the little toe. The ligaments on the dorsum, containing the two last metatarsal bones with the cuboid, are strengthened, whilst those of the sole are attenuated. The muscles of the limb are not strong or fully developed, but this deficiency is compensated in some measure by increased muscularity of the opposite member, if that be unaffected. After a certain time, and in the severer form of this congenital malformation, the interference of art is of no avail.

Since writing the above remarks, I have had occasion to practise division of the tendo achillis in a variety of cases, and at different periods of life,—in cases of simple extension of the foot, as well as those complicated by inversion. I have sent the greater number of these patients, for the purpose of having apparatus applied, to Mr. Bigg, Leicester Square; and he has also brought a considerable number to have the tendon divided, so that he might be enabled more readily to overcome the obstacles to the right position of the foot. He informs me (June 1838,) that, in all, twenty-five instances of division of the tendon have come under our care within the last six or eight months, and that almost uniform success has followed the practice pursued.

In some a rapid cure was effected, and in all, marked good effects followed. Even in the most unfavorable instances, when the deformity was both great and of long standing, the application of proper apparatus within a week or two after the operation produced a more decided improvement in the form of the limb in two or three months, than usually follows the adaptation of mechanical means alone in twice as many years. Division of the tendon, as recommended above, causes little or no pain, is unattended by loss of more than one drop of blood, and



is not followed by any unpleasant consequences. The most efficient apparatus for the purpose, and its mode of application, are here represented. Its action cannot fail to be readily understood.

The ham-string tendons may occasionally require division in the same way that has been described in speaking of contractions

of the muscles of the calf. The operation is a little more difficult, as some of the tendons lie deeply; by using a larger needle than the one described for division of the tendo achillis, no great trouble will be experienced. The following case is a good illustration of the effect of dividing contracted tendo achillis and ham-string muscles in the same person.

Case. Elizabeth Eden, ætat. 15, was admitted into the North London Hospital, Oct. 13, 1839, under Mr. Liston. She was able to walk well until she was seven years of age, when she lost the use of all her limbs without any apparent cause. Her right leg became contracted and flexed on the thigh, and the tendo achillis of the same leg became gradually shortened, so that she was unable to flex the foot on the leg. Her hands at this time were contracted and perfectly closed; she gradually recovered the use of these. At present, the right leg is flexed very considerably on the thigh, and the foot very much extended.

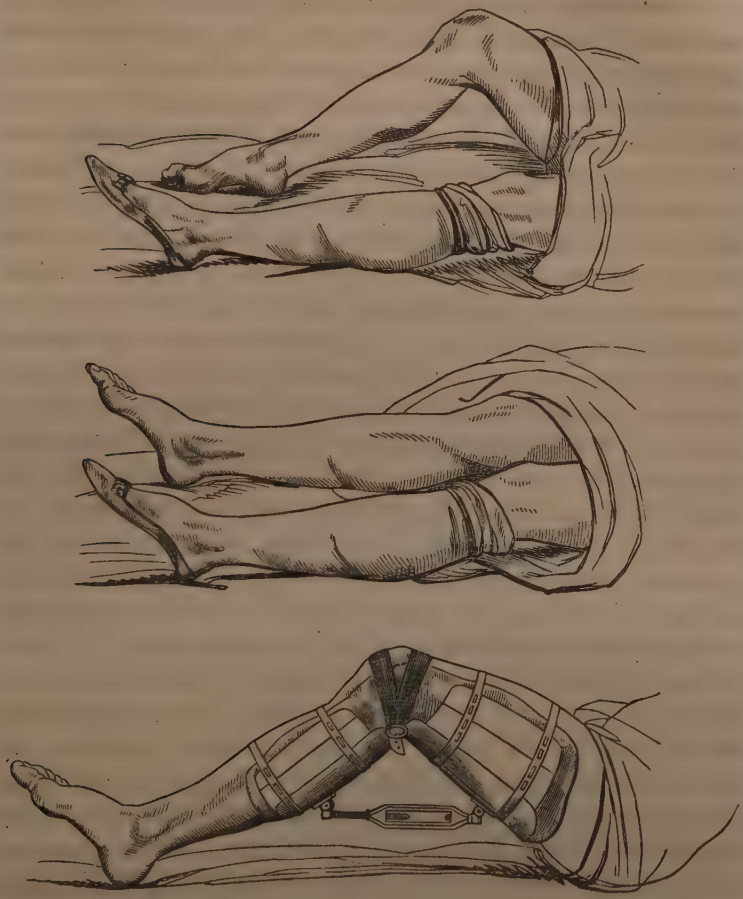
Oct. 20. A needle was introduced under the tendons in the ham, those of the semi-tendinosus and semi-membranosus; the tendo achillis was also at the same time divided.

Nov. 4. The usual apparatus had been applied to the foot, and an apparatus for the knee, consisting of wooden splints on the side and back of the leg and thigh, joined by a hinge at an angle under the knee, and having underneath the screw used for the common fracture splint, by means of which the splints may be gradually extended over the joint of the knee, and round the splint is a firm band, buckled, which keeps the splint firmly to the hollow of the ham.

Nov. 16. The foot can now be flexed as much as the other one—the knee is much straighter than it was a month ago.

Jan. 30, 1840. The knee is almost perfectly straight. The foot appears quite natural.

Feb. 30. The leg and foot are quite natural, but about two inches shorter than the other, on account of the slight developement it had undergone from long disuse. The appearance of the limb before and after the operation, together with the splint and extending screw, are here represented.



In some cases where the toes and foot are very much flexed, division of the plantar fascia may prove beneficial, and this may be done by a large needle passed under the fascia. It should be introduced about equidistant from the heel to the commencement of the toes on the inner side of the fascia, passed under it in an oblique direction from behind forwards, and by this means the fascia will be divided in the direction of the plantar artery, which runs in contact with it, and in front of this vessel. This is probably the best plan for providing against the danger of wounding the artery.

The extensor tendons of the toes may be divided with great advantage in some deformities of these parts, generally caused by squeezing the member into tight shoes or boots. The distal joints are bent, in consequence of the flexor tendon being stretched over the convexity formed by the head of the metatarsal bone when the toe is elevated. All obstacle to the proper position of the members is at once done away with by simple division of the extensor tendon. Besides the deformity, the pain is frequently so great, that patients often anxiously desire that amputation of the part should be practised. The simple expedient here described prevents the necessity of any such severe procedure.

For strabismus and other causes the division of some of the muscles of the orbit may be required. It is sometimes advisable to permit the upper eyelid to be constantly closed in patients who have lost the use of the eye, and object to wear a false one; and unless the contraction of the levator palpebræ be entirely overcome, no means will keep the eyelids permanently together. To effect this, it will be necessary not only to divide the muscle, but to cut out a small portion to prevent its re-union. This is easily done by making a small transverse incision through the upper eyelid immediately below the orbit. The dissection should be carried back a little, and the belly of the muscle being seized, it is divided by a pair of scissors, and being turned forwards, a piece is easily cut out. It must be recollected that the muscle is very broad at its insertion into the tarsal cartilage, and in order to cut it easily across, it is necessary to seek it as far back as possible. In a case in which I lately performed this operation it was attended with permanent success.

Strabismus is occasioned by contraction of several of the recti-muscles. The eye is drawn inwards by contraction of the internal rectus, downwards and inwards by contraction of the internal rectus and the inner border of the inferior straight muscle, and directly outwards by contraction of the adductor. To remedy these deformities, the various muscles require to be divided. The best mode of effecting this is the following:—the lower eyelid is everted, and a pair of spring artery forceps being fixed in the conjunctiva and allowed to hang down on the cheek,

this eyelid is constantly held open; with a common wire speculum, an assistant raises and fixes the upper eyelid with one hand, and with the other he fixes a small double hook in the conjunctiva on the inner side of the cornea, and pulls the eye outwards, the operator seizes the conjunctiva close to the caruncle, with a pair of common forceps, and divides it freely with strong pointed scissors. Another hook is then placed in the sclerotic which is now exposed, and the one in the conjunctiva removed. This is not always necessary. The tendon of the internal rectus is seen just at its insertion into the sclerotic; it is laid hold of by the forceps and divided by the scissors; the eyeball should then be turned upwards and downwards, and pulled well outwards, and its whole inner surface cleared of the tissue inserted into it. The hooks may be then removed, and the patient desired to look into the nose: if he still possesses this power, it results from contraction of the inner border of the inferior rectus, the hook should be placed low down in the sclerotic, the eyeball pulled upwards, and this part of the muscle divided. It is absolutely necessary in this operation to clear completely the inner part of the eyeball; the slightest fibre of the muscle remaining will prevent the success of the operation, and the only criterion of its perfect completion is the inability of the patient to turn the eyeball inwards to the centre of the orbit. The success of this operation when perfectly performed is very great; within the last three months I have operated on more than one hundred patients, in only one of whom the strabismus has not been cured. Very little inflammation follows the operation; the patient only requires to foment the eye three or four times daily for the first two or three days, and to wear a green shade over it; a little caruncle sometimes grows from the conjunctiva, which may be cut off with a pair of scissors, or subdued by the sulph. cupri: any little discharge from the surface of the eyeball is checked by some astringent wash.

The division of the external rectus is performed by an operation similar in all its steps to the preceding, the eyeball being pulled inwards instead of outwards. It is rather more easy than the division of the internal muscle.

These operations should not be performed in very young children, where the strabismus arises from any disease of the head or irritation of the intestinal canal, or unless the affection is confirmed. The practitioner in all cases should inquire carefully into the cause of the deformity, and remove it if possible by simple means, such as expulsion of worms from the intestine, the relief of any symptoms about the head, &c.

Numerous muscles about the shoulder joint have been divided, to facilitate the reduction of long standing dislocations, and the whole mass of the long muscles of the back have been cut through to remedy curvatures of the vetebræ. Of these operations I have had no experience.

CHAPTER VI.

ON INJURIES AND DISEASES OF BLOOD-VESSELS.

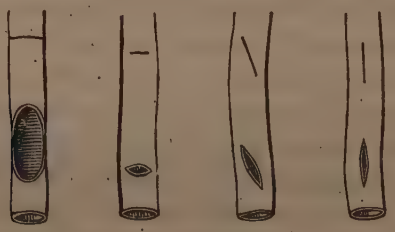
WOUNDED ARTERIES—ANEURISMS.

Bruising of an arterial trunk, detachment from its connexions, and consequent diminution in the supply of blood to its coats, are followed by sloughing or unhealthy ulceration, and escape of its contents, as is supposed to happen after some wounds, and certainly occurs, not unfrequently, after badly conducted operations. Hæmorrhage follows recent solution of continuity in the arterial ramifications, as a matter of course, to an extent proportionate to the size of the vessel, its vicinity to the heart, the force of the circulation, the quantity of circulating fluid, and the nature of the lesion. An opening in the direction of a vessel does not gape much, and is said not to admit of rapid or forcible ejection of the blood; but this is a mistaken notion, as I have had occasion again and again to notice. One instance may be given, to show that such wounds require prompt attention.

Case.—I had the misfortune, on one occasion, to wound the anterior tibial artery of a middle-aged man. He had received a deep laceration across the fore part of his leg, through the integument and fascia. Some days afterwards, he was admitted into the Edinburgh Hospital, labouring under a severe attack of erysipelas, with much tension of the limb. I deemed an incision proper, and likely to give relief. A bistoury was drawn in the direction of the limb, crossing the original wound. A

dresser, who held the foot, allowed it to escape; being more intent on seeing what was going forward than in assisting, as is often enough the case; in consequence, the man threw his limb suddenly and forcibly into the air. The knife was dropped, but an instant rush of blood, covering the by-standers, showed that mischief had been done. The foot was now secured, the femoral artery compressed, and the incision prolonged in the fascia betwixt the extensor of the great toe and tibialis anticus, so as to expose the vessel fully. It was seen perforated by a longitudinal incision, as represented in a subsequent page, from two to three lines in extent, and gaping very little, if at all. On relaxing the compression of the vessel in the thigh, the blood gushed out with great force and in an immense volume. Ligatures were passed and tied above and below the opening, and all did well.

The edges of oblique wounds, as seen in experiments on animals, are separated considerably, but not to such an extent as those across the course of the vessel. The degree of gaping in transverse wounds depends upon the extent to which the parietes are cut; an incision, for instance, involving a third of the canal, gives rise to a round opening; one involving two-thirds causes a large oval opening; and the flow of blood will bear



some proportion to the shape and size of the aperture. Partial division of a vessel is attended with a more continued and profuse flow of blood than a complete solution of its continuity, and is consequently more dangerous; contraction of the extremity of the artery, withdrawal of the injured part within its sheath, and coagulation around the orifice and within its canal,—the processes by which bleeding is arrested spontaneously,—cannot

take place unless it be cut completely across. Internal vessels are occasionally torn, in consequence of breaking up of the parenchymatous structure of organs. Suspicion of such an occurrence is excited by pallor of the surface, and the absence of reaction; the effusion occurs often to a great extent, and proves rapidly fatal. Laceration of external arterial trunks, with open wound, are often followed by no great or fatal effusion of blood; the external or cellular coat is elongated and brought to a point, whilst the internal coats are torn at various places, and puckered up within the external, so as to close the canal of the vessel and afford support to coagula, thus producing temporary obstruction to the arterial flow; and permanent closure often follows. Laceration, with consequent obstruction, occurs in the large vessels from an altered state of their coats, generally in persons advanced in life, but occasionally also in young persons. Several vessels may be affected in the same subject, without assignable cause. This accident is suspected to have happened, when coldness and lividity of the limb, and stoppage of the circulation in its principal artery and its branches, are observed. A feeling of uneasiness, and a sensation as if something had snapped, may have been felt by the patient at the obstructed point. Mortification is apt to follow this occurrence, more especially in the lower limbs.

Mr. Crisp, who is in practice at Camberwell, was so kind as to take me to see a young woman, whose leg he had removed, on account of mortification following closure of the femoral artery. In this case the vessels of all the extremities appear to have become closed, after an attack of inflammatory action in their coats,—a sort of general arteritis. No pulsation can now be felt in any of the arterial trunks of the upper or lower limbs, and there is difficulty in maintaining their proper temperature. The case, a very interesting one, is published in Vol. I. of "The Lancet" for 1836, page 534. This occurrence is usually attributable to a morbid rigidity, brittleness, and alteration in the tissues composing the arterial tubes.

Wounds of large vessels, and even of those of the second class, may prove instantly mortal, more especially if the solution of continuity in the external parts be free and extensive, and if the

vessel be only partially divided. If surgical assistance is to be of avail in such cases, it must be promptly afforded. If the blood do not escape in great quantity, and very suddenly, syncope may ensue. The circulation is then in a great measure suspended; its force at all events is as nothing; coagulation occurs in the wound, and opportunity is afforded of effectually and permanently staying the hæmorrhage; or this may be repeated at the commencement of reaction, and a fatal result ensue. Death will, in some circumstances, follow the division of one or more vessels of the second or third class, within a very short period; this happens occasionally in suicidal attempts, when only the lingual and superior thyroid, with their branches, are divided: and I have related, in the "Elements of Surgery," a case of immediate and fatal hæmorrhage from wound of one internal mammary artery, without opening of the pleural cavity. Wound of a vessel, without a patent and direct external opening, is attended with loss of blood; but great part of this may be collected in masses, the cellular substance being proportionably broken up; or it is extravasated extensively into the intermuscular sheaths and cellular tissue. This may occur to such an extent as to choke the circulation of the limb, and terminate in gangrene, more especially in advanced life, in the lower limbs, and if accompanied by other lesions. Or the tissues may become condensed around, so as to limit the effusion,—this coagulating in part, and becoming in part absorbed; but the blood still escaping gives rise to pulsation, the swelling gradually increases, and a circumscribed false aneurysm is thus established. When a vessel is cut entirely across, effusion of its contents may cease spontaneously, and a natural and permanent closure ensue. The retraction and contraction of the vessel, as above noticed, are followed by coagulation in the sheath, and in the canal of the vessel, to some extent,—often up to the first branch of any size given off above the wound. This clot forms a temporary barrier; lymph is forthwith poured out from the cut end of the vessel and its sheath, and from the surrounding exposed surface; the deposite is organized, seals up the end of the vessel, and gives support to the internal and conical clot of blood; this latter gradually diminishes in size, and disappears

entirely betwixt the thirtieth and fiftieth days. Bleeding so arrested may, however, recur at some distant period, in consequence of degeneration of the wound, and a sloughy condition either of the whole, or only of the deep parts, involving the vessel. Under some circumstances, this happens equally when the bleeding has been stopped artificially, as when spontaneous cessation has occurred; and it may arise from either general or local causes,—from the state of the atmosphere, the condition of the patient's health, or the nature of the wound. If a vessel of any consequence has been interested, the flow of blood, primary or secondary, may be furnished either by the upper or lower orifice,—out of that pointing to or from the heart.

As a consequence of degeneration in the arterial coats, aneurysm occurs in the vessels of the neck and extremities. Such aneurysms are remediable by the surgeon, and demand operative procedure; and even some of the trunk may thus be successfully treated. The names of Scarpa and J. Bell, of Abernethy, Astley Cooper, and Mott, will long stand pre-eminent in this department of surgery; they have improved our knowledge of the pathology of these diseases, extended the means of cure to cases formerly looked upon as hopeless, and thus materially benefited mankind.

The progress of an aneurysm, when once fairly formed, is uninterrupted and gradual,—whether it arises from wound,—from yielding and dilatation, in the first instance,—or from rupture of the internal coats, and ecchymosis; occasionally, a spontaneous aneurysm,—and even a false one, though that is indeed rare,—ceases to pulsate, and a cure may fortuitously occur, the tumour gradually disappearing, by absorption of the coagula and obliteration of the sac. The coagulation and subsidence of the tumour may sometimes be attributable to the operation of external causes, to pressure on the tumour, or to partial and temporary interruption to the flow of blood. One of the very first cases of interest presented at the North London Hospital after it was opened, (Nov. 1834,) was one of aneurysm at the bend of the arm, following venesection. The tumour was as large as a pullet's egg, and pulsated distinctly; but the pulsation, it appeared, was not so violent as it had been; the tumour

had also become somewhat painful, as well as more incompressible, and could not by any means be fully emptied. This change had taken place suddenly, and was attributed to pressure which had been made, both upon the tumour and in the course of the brachial artery. It was determined, under these circumstances, to wait, and watch the progress of the disease; and we had the satisfaction to notice the pulsation cease, with complete condensation of the tumour, and its gradual disappearance. This man came to the hospital, two days ago, with a companion who had got drunk and injured his head; I examined his arm, and begged him to return to show its condition to the pupils: he did so yesterday (May 17th, 1837) at the visit, and exhibited the limb quite sound, with the pulsations in its vessels free and natural; strange to say, there appears to be no obliteration of the vessel at the bend of the arm. There is a specimen in the museum of University College, of false aneurysm at the bend of the arm, which underwent a spontaneous cure, presented by Mr. Oldknow, then a celebrated surgeon at Nottingham. The remains of the sac, cut off from all connexion with the artery, which is pervious, is seen betwixt that vessel and the vein. It is almost obliterated, and contains a small coagulum.

However, a cure of aneurysm, whether false or true, can scarcely be expected to take place, unless from an operation by which the flow of blood into the sac is interrupted or weakened. The course of the circulation is thus directed into other channels, and coagulation is permitted to take place in the sac, and in the vessel, to some extent. The formation of aneurysm from wound may sometimes be prevented, by the immediate adoption of proper means, and this leads to the consideration of the means for arresting permanently the flow of blood from large vessels under different circumstances.

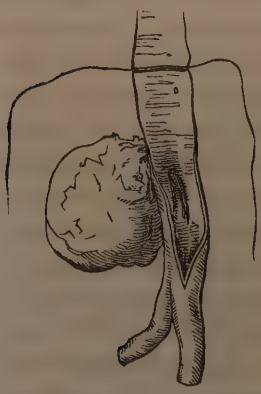
The management of hæmorrhage from the smaller vessels, in ordinary solutions of continuity, has been treated of in the first chapter. An open vessel in a large wound can be seen, and having been laid hold of by the fingers, forceps, or hook, can be surrounded by a ligature. If the vessel has been cut across, the lower end, if it can be found, ought also to be secured. If the vessel is partially divided, it may be a little more exposed by

dissection, but not disturbed from its connexions, and two ligatures, are then passed round it, one above the opening, the other below; these having been secured, the vessel may be divided, and the ends allowed to retract, or not, according to the judgment of the surgeon. It is not necessary that this division should be made; but if the ligatures be well applied, it can be followed by no bad consequences. In punctured or indirect wound, connected with open artery, the proceeding of the surgeon will be regulated by circumstances. If blood has flowed freely from the external wound, if hæmorrhage has taken place again and again to an alarming extent, and is likely to recur,—the sooner the vessel is cut down upon, the wounded part exposed and treated as already recommended, the better. There is no use in waiting for a fresh attack of bleeding. The situation of the wound, and the history, ought to satisfy the surgeon of the practice he should adopt, and that must be resorted to at once, without hesitation or delay. It will thus be done much more coolly and satisfactorily, than amidst the confusion and alarm incident upon hæmorrhagic attack.

But when effusion of blood has taken place into the tissues of the limb, around the wound in the vessel—when the external opening is small, has healed, or nearly so, and has not for a time furnished blood,—then there is no occasion for instant operation. The extent of the effusion, and site of the aneurysm, will decide the surgeon as to the proceeding in the particular case. When the tumour is small and recent, containing little or no coagulum, and when the vessel involved is superficial, then the incision may pass through the aneurysm to the point of the vessel which has been wounded. The certainty of a cure will thus be enhanced. If the sac be filled only with fluid blood, and the anastomoses are free, there is risk of the return of the pulsation, or a continuance of the disease, if one ligature only be applied; therefore, the vessel should always be tied both below and above the opening. Nothing here contra-indicates incision on the injured part. But when the tumour is large, and of some standing, ligature of the trunk betwixt it and the heart will in all probability be followed by a successful result, and is attended with less difficulty and risk, than would be incision of the sac, and

uncertain search for the open vessel amongst disordered parts. In punctured wound, penetrating an arterial trunk, and before extravasation has occurred, the opening may be closed so as to prevent the formation of a false aneurysm; this is effected by nicely-adjusted pressure.

In order to be able to apply sufficient compression on the wounded part the surgeon must previously give uniform and equable support to the whole limb below. The fingers or toes, as the case may be, are rolled separately, the hollows of the hand or foot are padded, and the pads are retained by bandage. This having been carried up to the wounded point, one compress after another, the first one being very small, firm and graduated, is placed on the wound, and secured by turns of the roller; during the application of the compressing apparatus, constant pressure with the thumb is maintained on the wound. The limb is placed in an elevated position, and preserved in a state of repose; and the pressure must be kept up for eight or ten days at least. This may either have the effect of causing agglutination of the parts around the wound, in connexion with the vessel, so that the opening in it may be closed; or if the pressure is well applied, and kept up, and the wound in the artery has been considerable, obliteration of the canal may result. But unless the plan is adopted before ecchymosis around the vessel has occurred, it will not be effectual in preventing the formation of aneurysm. And when once this has formed, when the edges of the opening are smoothed and rounded off by the escape of blood, pressure will afford little chance of benefit, and not unfrequently is prejudicial, from causing excoriation and slough of the integument and sac, followed by troublesome hæmorrhage. The annexed sketch represents probably as small an aneurysm as is to be found in any collection. It is one of three days' growth—formed under pressure, applied too late, and in a slovenly manner. The patient, a middle-aged woman was brought into



the Royal Infirmary of Edinburgh, under one of my colleagues, in consequence of dreadful injury of the chest and head. She was bled at the bend of the arm by one of the dressers. The brachial artery was noticed to be wounded, but some hours elapsed before pressure was made on the part. The woman died within four days, from the effects of the injuries for which she had been admitted. The vessel and aneurysm are here shown of the natural size; the effect of a ligature upon the internal coats is also represented in the sketch.

The wounds and aneurysm of particular vessels, with the necessary operations, now demand attentive consideration; and those of the neck and head may be treated of first. Wounds of the carotid and its primary branches are often enough presented to the surgeon. The external wound is generally transverse, and gapes widely when the head is thrown back. The hæmorrhage is always abundant,—the blood, from the vicinity of this region to the heart, flowing out with great impetuosity. When the common carotid is cut, there will seldom be a chance of giving assistance. If it happens that a medical man is on the spot when the wound is inflicted, he would be to blame if he did not, with his fingers, seize and compress the ends of the vessel, and take means for the permanent arrest of its flow. There is no occasion for any incisions or dissection; the parts can generally be sufficiently exposed by position so as to allow the ends to be drawn out, and the vessel to be surrounded by one or more ligatures. The bleeding can be commanded for a time, by placing the thumb firmly over the vessel, as it emerges from the chest, betwixt the trachea and the sternal origin of the sterno-mastoid muscle. The smaller vessels are to be similarly treated as they present themselves; and the patient must be watched when reaction commences, so that they may be all noticed and secured. The surgeon in such case will find the advantage of being provided with a pair of spring artery-forceps, such as are in constant use at the North London Hospital; the catch is small, and does not hold till the forceps are firmly closed upon the vessel. For ligature of vessels in any situation, they are preferable to all others; and when the surgeon is so situated that he can command no assistance, they are quite invaluable.

Wounds of the neck require particular notice, as regards the dangerous consequences arising from implication of the air-tube, and the means of obviating these. In Chapter XI. information on the subject may be sought.

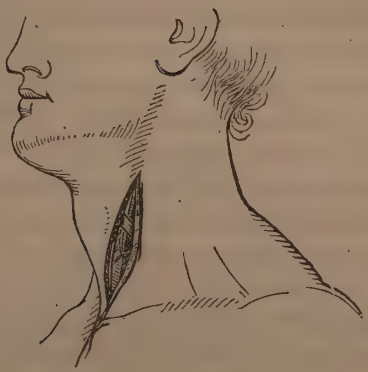
Punctured and penetrating wounds of the neck, involving the common carotid, or its branches, require to be attended to. If there is much external bleeding and threatened danger from extravasation, incision on the wounded part of the vessel must be resorted to. The external wound may be so situated, that its dilatation would not lead safely to the bleeding point. A probe may be passed into the track, to show the exact spot to which the incisions should be carried. The opening in the vessel will thus be discovered; at all events, by relaxing the pressure on the trunk, its situation will soon enough become apparent. Two ligatures are passed round the vessel, and tied one above, the other below the wound; in tightening the noose, the points of the fore-fingers ought to be used instead of the thumbs—the common practice of those who are awkward, or inexperienced. If circumstances do not demand this early interference, the formation of false aneurysm, and a subsequent operation, for the stoppage of its supply of blood, may be anticipated; for, here, pressure can seldom be applied for any length of time, so as to prevent the formation of aneurysm. Larrey relates a case in his Egyptian Campaign, however, in which a wound of the carotid, or of its primary branches behind the angle of the jaw, was cured by compression. In this situation pressure may be applied methodically, and persevered in, by bandaging round the head and knotting the roller over the graduated compresses, or rather turning one head of the double roller back very tightly in a reversed loop of the other, and repeating this manœuvre again and again. Thus, at least, the external hæmorrhage will be commanded, and an opportunity afforded, at a future time, of getting over all the bad effects of the accident by ligature of the common carotid.

Spontaneous aneurysm at the angle of the jaw is not an every-day occurrence, and few cases are recorded. The signs of aneurysm in this situation cannot well be mistaken. A tumour is undoubtedly aneurysmal, when progressively on the increase,

at first compressible, diminishing under pressure, and pulsating violently, throughout its whole extent, at the margins as well as in the centre; also when the pulsation ceases, and when on pressure being made on its proximal side, the swelling subsides in whole, or in part, according to the size, duration, and quantity of solid matter, the layers of lymph, and coagulum, it contains. Several of the signs may exist, in deep-seated tumour or abscess, lying close upon this large vessel, but the absence of the more unequivocal will decide the question. The existence of aneurysm, in the upper part of the superior triangular space of the neck, having been ascertained, the surgeon must consider what steps are to be taken to obtain a cure. This is now, thanks to Sir A. Cooper, a matter admitting of no doubt. Ligature of the common carotid has by that most distinguished surgeon been placed amongst the regular operations. But before undertaking any operation for aneurysm, more especially by ligature of a vessel near the heart, it will be advisable to see that the circulation is in a quiet state; and, if not contra-indicated, it may be found a safe precaution to diminish the quantity of circulating fluid, by one or more venesections, and by a strict limitation of diet. The effects of disturbing the flow of blood to the brain was much dreaded in earlier times. The disease was looked upon as irremediable, and the patient left to his fate. A case is given by J. Bell, in which, so late as the year 1807 or 1808, a poor woman was allowed to perish by hæmorrhage from the sac, under the eyes of himself and colleagues,—a whole college of surgeons, at that particular period, claiming to be surgeons to the Royal Infirmary of Edinburgh. Both carotids have been tied in the human subject, with but a short time intervening, and without any bad effects arising. Sir A. Cooper, still as zealous as ever in the advancement of science, has, by experiments on the lower animals, shown that the effect of interrupting the flow of blood, in all the vessels supplying the brain, is immediate suspension of respiration and circulation. But the ligature of one vessel after another, carotids and vertebrals, giving time for the anastomoses to become enlarged, was ultimately and perfectly recovered from, though evidently productive, for a time, of annoyance and uncomfortable feelings to

the animal. The paper on this subject, and the drawings in the Guy's Hospital Reports, must prove exceedingly instructive and interesting to those who have not had the good fortune to examine the magnificent preparations illustrative of the subject.

The common carotid can be exposed, without much difficulty or risk, by an incision through the skin, platysma-myoides, and fascia of the neck. For this purpose, the patient should be placed recumbent, with the head thrown back, and the face turned a very little to the sound side. The instruments that may be required, and which should be at hand, are a small scalpel or two; good dissecting forceps; two copper spatulæ, each about an inch broad; a slightly curved aneurysm needle, well blunted, and with a round opening close to the point, sufficient only to receive the ligature of strong stay-silk or thread, with which it is armed; and a few suture needles to complete the apparatus. Sponges and lint are not to be forgotten. A director is omitted, as being very useless,—and, what is worse, its employment being likely to lead to mischievous laceration of the tissues, and disturbance of the vessel from its connexions; neither is that absurd tool, a blunt silver knife,—another refuge of nervous and unskilful operators,—admissible into the apparatus of a good surgeon. An incision of from two to four inches long, according to the depth of the vessel, is made over its course, and its middle is, if possible, placed over the point where the omo-hyoideus muscle crosses the sheath: the practicability of this will be determined by the size and site of the aneurysm. The first incision should penetrate the skin, platysma-myoides, and superficial fascia. The head may then be turned a little, and slightly bent forward in order to relax the sterno-mastoid, so that the cellular tissue lying over the deep fascia and sheath may be raised with the forceps and divided cautiously; or it may be cut with the hand unsupported, the blood that oozes out being absorbed by an assistant with a bit of soft sponge, in order that the operator's view may be uninterrupted. The fascia is cut in the same way; and the border of the omo-hyoideus having been exposed, is perhaps turned up a little with the handle of the knife, the branches of the descendens noni being carefully avoided. The artery is now seen distinctly; and the



sheath is opened on its fore-part, so as to show about half an inch of the anterior parietes. There is frequently a vein arising from the internal jugular about the middle of the neck, crossing the carotid artery, and going to the thyroid body; if cut, this vein would furnish large quantities of blood, and obscure very much the view of the vessel; it must be carefully avoided. The par vagum is discovered outside, betwixt the artery and internal jugular vein. The point of the aneurysm needle having been passed, with very slight lateral motion, betwixt the nerve and artery, is slipped behind the latter without force, until its point is felt on the mesial side by the fore-finger of the left hand, which is pressed upon it so as to make it transfix the cellular tissue; the loop of the ligature thus brought into view, is seized by the forceps or a small blunt hook, and having been pulled through a little, the needle is withdrawn. The loop, or bight is cut, and one portion removed; the ends of the ligature are then held in one hand, whilst with the fore-finger of the other the vessel is compressed against the loop, and the effect upon the aneurysmal tumour noticed; if satisfactory, the ligature is forthwith secured by the reef-knot, represented in p. 30. This must all be done without disturbing the vessel, without detaching it from the sheath, or breaking up its fine cellular connexions laterally and behind, farther than is barely sufficient for the passage of the needle. There must be no elevation of the vessel on the handle of the knife, or on the director, as if in tri-

umph at the almost unexpected succees in finding it. This practice seems still to be followed, and is even represented in the plates accompanying some modern surgical works. Those who teach or countenance proceedings of the kind, must have paid but little attention to the physiology and pathology of the circulating system, and must have had but few opportunities of witnessing surgical practice. Ulceration of the vessel, and secondary hæmorrhage on or about the separation of the ligature, are the almost inevitable consequences of the practice here reprobated.

The vessel having been secured, the pulsation arrested, the size of the tumour diminished, and the feelings of tension and pain, which are often highly distressing, relieved,—the edges of the wound are put together by one or two points of suture, both ends of the ligature being brought out in the middle of its track; cold water is applied, and, after a few hours, a strip or two of isinglass-plaster may be laid across the wound; the stitches may remain for some days, if they do not seem to excite irritation. The ligature generally separates about the fifteenth day, and at the same time the trifling discharge that oozed along it ceases, and the parts become consolidated. The disadvantages attendant upon the practice of cutting the ends of the ligature close to the knot, and of applying more than one—and the folly of employing ligatures of animal matter, such as catgut, or fish skin, with the hope of their disappearance by the action of the absorbents,—are now, it is hoped, fully known and appreciated. Yet—in exception—two ligatures should always be used, whenever, by any awkwardness, the vessel is much disturbed from its cellular connexions. The effects of this operation on the tumour, the consolidation of its contents, and the change upon the collateral circulation,—prepared so far by the obstruction caused by the disease,—are now also well understood.

The carotid has been tied, with the view of diminishing swellings composed of erectile tissue when of large size, or occupying situations, as the antrum or orbit, from which they could not be wholly extirpated; and sometimes the operation has been followed by very favorable results. The vessel has also been secured in cases of hæmorrhage from the cavities of the face; the

operation has been resorted to, in order to arrest the growth of tumours of the face and jaws; but for this latter purpose it must be ineffectual. It has also been performed as a preliminary step to the removal of such diseases; but the suffering of the patient is thus much prolonged, without his safety being at all enhanced, or the dissection of the tumour in any way facilitated. The flow of blood is quite as effectually commanded by pressure with the fingers on the common carotid on the affected side; pressure on both at the same time has given rise to the most alarming convulsive movements, in some cases, after great loss of blood had occurred. Pressure even on one trunk is not demanded in many of the operations in question. I have, I believe, had as much experience in the management of tumours of the mouth and jaws, and of the face and neck, as any surgeon in this or any other country, and have never found occasion to tie the carotid previous to or during the operations for their removal. And I have never regretted omitting this supposed precautionary measure.

The arteries running to the thyroid body have been tied, with the view of diminishing hypertrophy, by which it is sometimes affected; but no good purpose has been answered by such proceedings. The operation is not likely to be repeated, and does not "merit mention" here. The primary branches of the external carotid are often involved in wounds, and are exposed and divided in operation, so as to require ligatures. The common trunk of the internal maxillary and temporal has been tied previous to the removal of tumours, but to this there is the same objection as that stated in regard to preliminary ligature of the carotid; it is an unnecessary complication of the proceeding. I have often tied this vessel, after disarticulating the lower jaw, instead of securing its various branches; by finding the posterior belly of the disastric and the styloid process, it is easily exposed in the lower corner of the wound, so that a ligature may be thrown around it.

The lingual artery may be tied by cutting upon the os-hyoides, through the skin, the anterior border of the platysma-myoides, and the superficial fascia, and dissecting in the course of the vessel, as it lies along the superior aspect of the bone. The

tendon of the digastric and the lingual nerve, which lie higher in the neck, are separated from it. The incision should extend from a little below the symphysis of the jaw, over the corner of the os-hyoides to the border of the sterno-mastoid. The plexus of veins in this situation, may, if cut, furnish a considerable quantity of blood. They should be avoided as far as possible. If the hæmorrhage obscure the proceeding of the operation, temporary ligatures may be put on the bleeding points, and removed afterwards. The cases requiring such an operation must be rare. On one occasion I tied the vessel of each side, on account of an erectile tumour involving the tongue: the operation was to a certain extent successful.

The branches of the temporal are the subject of surgical operation; blood is sometimes abstracted from them; troublesome ulcer, with repeated attacks of secondary hæmorrhage, and the formation of false aneurysm, are not unfrequently the result,—attributable, in some instances, to bad management. In the first place, then, as to the operation of arteriotomy. The propriety of taking away blood from the temporal artery in particular cases, in preference to abstracting it from the general mass of circulating fluid by opening a vein, cannot be discussed here; as a mode of local bleeding, it is certainly to be preferred to the scarification and cupping of the temples. This last is more painful, and produces deformity; besides, the same troublesome consequences occasionally result as from arteriotomy. It is not long since I assisted my colleague, Mr. S. Cooper, in operating on a case of aneurysm of the anterior branch of the temporal, consequent upon the application of the cupping-scarificator.

If it is deemed advisable to take blood from the temple, the most full and prominent branch of the artery, the middle or anterior, is chosen; it is fixed, and the skin prevented from sliding upon it, by the fore and middle finger of one hand, passed firmly above and below the point intended to be opened. A lancet, the handle at an obtuse angle with the blade, held firmly betwixt the thumb and fore-finger, is pushed through the integument until its point enters the vessel: the object must be to cut it about half across, and to make the opening in the skin

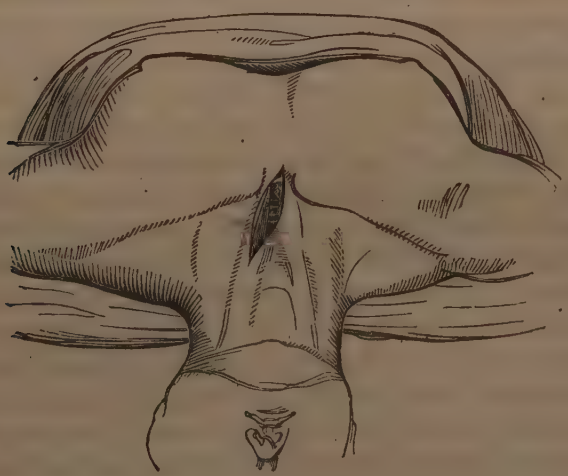
about twice the size of that in the vessel. With this view, the handle is raised and the blade carried forwards, the point being stationary, so that the opening may be sufficiently enlarged, by the shoulder of the instrument, in withdrawing it; thus no obstacle will be offered to the free escape of blood. If blood flows freely, good and well; if not,—owing to insufficiency of the opening, extravasation into the cellular tissue, or the smallness of the branch,—a cupping-glass may be applied with good effect, the lower edge being raised so as to permit the onward flow into the part of the vessel included. The desired quantity having been obtained, the bleeding is arrested by placing the finger upon the vessel above the ear; if the branch is small, and the stream of blood has not been forcible, pressure may be safely relied on; but if the hæmorrhage continues with impetuosity on withdrawing the finger, it will be the best plan at once to divide the artery completely; this is effected by again introducing the lancet, and, by a movement of its point, making the deep incision of corresponding extent with the external; the ends of the vessel retract, and soon cease pouring out their contents. The edges of the wound are then put together by the finger and thumb, and small, firm, graduated compresses are applied and retained by a narrow double-headed roller, passed a few times round the head; and this should not be removed for at least forty-eight hours. During unhealthy seasons, ulceration over the vessel occasionally follows this little operation, from improper application of pressure, or of irritating plasters; and either commences in the artery, or involves it secondarily. The consequences are, occasional oozing of blood under the dressings, at first in small quantities; a puffy, œdematous state of the cellular tissue, with swelling and redness around; then more violent and alarming hæmorrhage, perhaps to syncope, repeated from time to time. Pressure cannot be made upon parts so diseased, nor would it be effectual if applied to a vessel in that state. An extensive incision must, without hesitation, be carried through the infiltrated tissues in the course of the artery, down to either the fascia of the temporal muscle, or the coverings of the frontal or parietal bones, according to the situation of the bleeding point. By this proceeding, the vessel will, in all probability, be divided

on each side of the original wound, and each open extremity can then be laid hold of and secured by the artery-forceps or hook; or it may sometimes be necessary to surround them by ligature, carried in a sharp needle fixed in a handle,—or in the common suture-needle, if nothing else is at hand. A surgeon should, by custom, be ready to make use of whatever apparatus he can most readily command at the instant; for, in unpremeditated operations, the most choice instruments cannot always be had. If a man has studied operations, and knows well what should be done under different circumstances, he will generally accomplish his object with very simple means, and make one instrument serve a variety of purposes.

Aneurysm follows either accidental or intentional wounds of the branches of the temporal; the pressure may have been so applied, as to favour closure of the wound in the superimposed parts, whilst the blood still oozed out into the tissue around the vessel; a sac is soon formed, and a pulsating tumour appears, emptied by pressure, applied either to the tumour, or on the vessel towards the heart. Ligature on the proximal side cannot be depended upon for a cure, the sac often filling again from the free anastomosing branches. The best practice is to cut through the tumour, exposing the vessel to some extent, and to apply a ligature on each side of the opening; after these operations, the wound is encouraged to discharge, and heals by granulation.

The arteria innominata has been exposed and tied on the living body five times, but without ultimate success, by Mott, Graefe, Lizars, and others. Recourse to this operation may be demanded in consequence of aneurysm of the right carotid descending low, or aneurysm of the subclavian occupying the inferior triangular space of the neck. Spontaneous aneurysm of the carotid commences generally near its bifurcation, as do aneurysm in all vessels: and it is only when long neglected,—when the tumour has attained a large size by the yielding or bursting of the sac into the cellular tissue, and consequent extension of it,—that it can occupy so much of the superior triangular space, as to preclude the possibility of securing the common carotid. If aneurysm of the right subclavian is so situated, or so large, as to render impracticable the application of a ligature

outside of the anterior scalenus, then, if anything is to be attempted, it may be the better practice to deligate the anonyma, than to attempt ligature of the subclavian close to its origin, amidst the numerous branches given off from it. The operative procedure is not more difficult, whilst the chance of permanent obliteration and cure of the aneurysm is far greater; on this account it is preferable, the more so when we keep in view the risk of wounding any of the important parts by which the former vessel is surrounded, at the particular point,—such as the vagus nerve, the recurrent, phrenic, and the branches of the sympathetic, the subclavian vein, and the pleura. But there is little chance of coagulum forming on either side of the obliteration caused by the ligature. In cutting down upon the arteria innominata, the patient is placed upon a table, and the parts on the fore part of the neck are put upon the stretch by position of the head and shoulders; an incision is commenced near the right sterno-clavicular articulation, and carried upwards, for about three inches, through the skin and superficial fascia, a little to the inner side of the margin of the left sterno-mastoid muscle,



in order to afford ample room for the prosecution of the deep dissection; a second incision may be made, if necessary, from over the sternal origin of the right sterno-mastoid muscle, to

meet the lower end of the first incision at nearly a right angle; the flap of integument and subjacent fatty matter is turned back, and the dissection is cautiously pursued through the deep cervical fascia, to near the origins of the sterno-hyoid and thyroid muscles. If there is a want of room felt in the deep incisions,—risk of which is much obviated by placing the first incision a good deal to the left of the mesial line,—the sternal origin of the right mastoid muscle, with some of the fibres of the hyoid muscles, may be divided; the commencement of the right carotid will thus be exposed, and become a sure guide to the vessel sought: it is to be carefully cut upon, and the ligature passed round it. The simple needle, already described, will answer the purpose; but in case of difficulty arising, in consequence of the depth and narrowness of the wound, it is well to be provided with a very admirable instrument, invented and manufactured by Mr. Weiss, for the purpose of surrounding deep arteries by ligature; or we may employ the needle used by my friend Dr. Mott, who was the first to practise this operation. Each is so contrived that the point, after having been felt under the vessel, can be laid hold of and detached from the stalk of the instrument. The contrivances by which this is effected, are simple and ingenious.

From the fatal results that have always followed ligature of the innominata, few surgeons would now be found sufficiently hardy to undertake such an operation; and there are no circumstances that will warrant the surgeon putting a patient to the pain and risk of an operation which will, in all probability, prove fatal, perhaps, sooner than the disease for which it is undertaken. Two years ago a modification of this operation was proposed by Mr. Quain; and which I performed on a patient suffering from aneurysm of the subclavian, commencing immediately external to the scalenus muscle. The carotid and subclavian were secured immediately as they arose from the innominata; it was supposed that by this means this greater length of the artery, from the aorta to the point of deligation, would permit a firmer coagulum to form in this situation. The patient perished from hæmorrhage on the thirteenth day. A clot had formed in the innominata, but the numerous branches arising

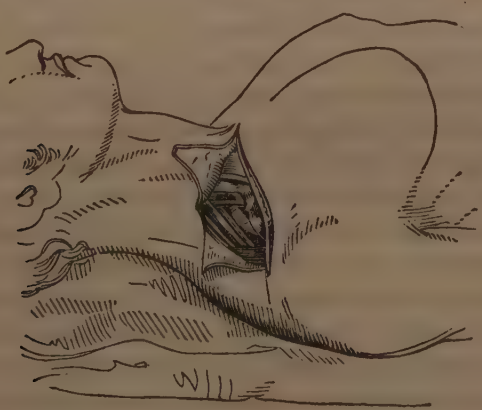
from the subclavian carried on the circulation on the distal side of the ligature, and no clot formed here. When the ligature was beginning to be detached from the vessel, blood was freely poured from the distal extremity of the divided artery, and the patient soon perished. The man in whom this operation was performed was much reduced, and was not in a favorable state for the adhesive process to go on. Another case, in which both vessels were included in one ligature, it being the intention of the operator to secure the innominata, is mentioned by M. Velpeau, as having occurred in the practice of M. Kuhl of Leipsic. This case also terminated fatally.

The subclavian artery may be tied in three situations; internal to the scalenus, under the scalenus, and external to that muscle. The two first operations would be required when there was aneurysm or disease of the coats of the artery in the third part of its course. The first of these operations requires the same incisions as those recommended in the operation on the innominata; the transverse incision being also made over the sterno-mastoid, that muscle, as well as the sterno-hyoid and thyroid, being divided in the same direction; the artery is exposed with a little dissection. The internal jugular vein being pulled outwards by a copper spatula, the aneurysmal needle should be passed from below upwards. It must be recollected, in performing operations on this vessel, that it varies in its course and distribution; it may pass from the aorta behind the trachea, or it may come off from the innominata, quite behind the carotid, and on a plane posterior to that vessel. This was the case in the last patient for whom I put a ligature round the subclavian internal to the scalenus. He was suffering from rapidly increasing aneurysm of the subclavian, immediately external to the scalenus. The other patient, whose case is above related, was in so unfavorable a state for the adhesive process, that I determined to repeat the operation in this patient, who was in perfect health. I intended to secure the two arteries as they arose from the innominata; but the subclavian was, with some difficulty, discovered so far posterior to the carotid, that I supposed it crossed behind the trachea, and that there was in fact no innominata. The subclavian, therefore, was

ligatured. The patient died of secondary hæmorrhage at the end of the thirty-sixth day. On dissection, it was discovered that the subclavian came off from the innominata quite behind the carotid. The ligature was situated about three quarters of an inch from the origin of the vessel, which was plugged with a firm coagulum; on the distal side of the divided vessel, the vertebral and other arteries arose immediately outside to where the ligature was placed; they had freely kept up the circulation, and it was from this part of the artery that the hæmorrhage occurred. The artery has also been secured by Mr. Colles of Dublin; his case also terminated fatally. From the result of these three cases, I would neither recommend nor practise again ligature of the vessel in this situation.

On account of disease of the coats of the artery, in the third part of its course, or on account of small aneurysm of the artery as it lies on the first rib, or when an axillary aneurysm has attained so large a size and projected so far under the clavicle that the subclavian cannot be secured external to the scalenus, it may be necessary to tie this vessel underneath this muscle. The operation may be performed by making an incision a little external to the posterior border of the sterno-mastoid, commencing two inches above the clavicle, and continued down to that bone; another incision, three inches in length, may be made over the clavicle, to join the inferior extremity of the previous one. The flap is raised upwards and inwards, consisting of the skin and platysma. If the external jugular vein is exposed, it should be pulled outwards. The clavicular attachment of the sterno-mastoid is then divided for about two inches: some cellular tissue is cut through, and the anterior scalenus is exposed, with the phrenic nerve lying on its internal border; this, together with the internal jugular vein, should be pulled inwards, and guarded by a copper spatula. The muscle is partially divided from without inwards, by means of the forceps and scalpel: and, the vessel being sufficiently exposed, the aneurysm needle should be passed from below upwards. This operation has been twice performed, and with perfect success, by Dupuytren and myself; and in some rare cases the surgeon would be warranted in passing a ligature round the vessel in this situation.

The subclavian arteries may require ligatures to be placed upon them, in consequence of either true or false aneurysm in the axilla; the lower these are placed, and the smaller their size, the more simple will be the proceeding. It is a matter of no small difficulty to reach these vessels, more especially the left, when the tumour has bulged somewhat under the clavicle, and when,—from the size of the swelling, and in order to relieve the pain and numbness of the limb consequent upon the pressure on the axillary plexus,—the shoulder has been long retained in an elevated position. In performing this operation, the patient should be recumbent; and in order to facilitate the deep dissection, the limb of the affected side should be as much depressed as possible, and the head turned somewhat to the opposite side. An incision is made upon the clavicle, along its whole course, through the skin stretched by the fingers of both hands of the assistant-surgeon, applied so as to pull it downwards; the integument is then allowed to resume its place, so that the incision traverses the inferior space of the neck; and a second incision, carried along the outer border of the mastoid muscle, is made to fall into this. The superficial muscle, fascia, and fatty matter, are turned aside with the integument.



Why these should be divided upon a grooved director, and cautiously, as advised and taught in the schools, puzzles me much. Why great caution should be observed in cutting the

fibres of the platysma-myoides, or what risk can arise in this stage of the proceeding, I cannot discover. Great caution, coolness, and steadiness, are assuredly necessary in the after part of the proceeding; but even the most delicate and dangerous parts of the operation can be got through both safely and cautiously, without this favorite instrument, and without any tearing, burrowing, or thrusting with blunt tools. The coats of the vessel are not so delicate or fine that they will yield to a scratch with the point of a knife, and when this instrument is used delicately and with a steady hand, no risk can accrue from cutting down to the vessel, instead of scraping a hole towards it. The vessel, as regards its chance of assuming a healthy action, will be left in a much better and more satisfactory state, after the former than after the latter mode of proceeding. The external jugular vein crosses the space, and is easily recognised; and it will generally be possible, by dividing the cellular tissue on its mesial aspect, to ward it to the outer side of the wound, out of harm's way. Sometimes, however, it lies so much in the direct course of the vessel, that it cannot be so disposed of; and if it cannot be held to either side of the wound, it must be divided, and either compressed or surrounded by a fine temporary ligature. The loose tissue filling the space is now divided, the posterior belly of the omo-hyoid muscle exposed, and the deep fascia covering is cut on its inferior aspect; by copper spatulæ, the muscle is pulled to the outer and upper side of the wound, and the supra-scapular artery towards the clavicle. The outer or distal edge of the scalenus anticus can now be felt or seen, the branches of the brachial plexus come into view, and, by dissecting down carefully on their fore part, the vessel is discovered as it lies on the first rib, emerging from under the insertion of the muscle into that bone. The aneurysm needle is passed down with its convexity forwards, and, by gently insinuating its point, may be brought over and behind the artery: if foiled in this, it must be passed in the opposite direction, the point being felt for, and guided by the fore-finger of the left hand. If the point of the needle is properly made, blunt and rounded, and prudently managed, the subclavian vein lying on the anterior and inferior aspect can be in no danger. The

ligature having been duly conveyed, some difficulty may be experienced in drawing it with sufficient tightness; it may be found impossible to reach the vessel with both fore-fingers; as a substitute for these a serre nœud may be used,—a strong wire perforated or notched at one end. One only, or two of these may be employed, or a double one, according to the judgment of the operator; of course, before securing the vessel definitely, it will be right to ascertain the effects of tightening the ligature. When the wound is very deep, it is no easy matter,—for pulsation is an uncertain guide,—to ascertain exactly what may have been exposed and taken up by the needle. It happened to me in one of the operations which I performed for axillary aneurysm, (and by the way it was the first successful one in Europe, at all events in this country,) that the inferior nervous band, passing out to form the axillary plexus, was surrounded by the ligature; this was soon discovered; and the ligature, still retained, was made to serve a good purpose; as by it the nerve was pulled upwards a little from its situation, so as to admit of the more ready exposure and deligation of the artery. After the operation is completed, the edges of the wound are put together with a point or two of suture; the limb is elevated, so as to favour the return of blood, and rolled in fleecy hosiery, or cotton wool, retained by a handkerchief sewed around.

Aneurysms are met with at the root of the neck, and so situated that there is no possibility of reaching a sound portion of vessel betwixt them and the centre of the circulation, so as to interrupt the flow of blood. It must be kept in mind that aneurysms of the aorta sometimes rise upwards and bulge into the lower part of the neck, and it has happened that mistakes in diagnosis have arisen in this matter; that aneurysm of the great trunk has been taken for aneurysm of the left carotid or subclavian. It has been proposed to treat aneurysms of these vessels close to their origin, by ligature on their distal side. This practice has been followed in a variety of cases, and in a few with some apparent temporary advantage. The contents of the sac have coagulated to a certain extent. But the results of these operations have, on the whole, not been very encouraging; and great difficulty has even been expe-

rienced, in some instances, in finding the vessels. When it is recollected that an artery, beyond aneurysm of some standing, is frequently filled with coagulum, contracted, and in some instances altogether obliterated,—it is not to be wondered at that a search for it should be sometimes attended with trouble, and that occasionally no very happy result should have crowned the attempt to benefit the patient thus. This is a proceeding which, in a favorable case, and at the earnest solicitation of the patient, a surgeon might be induced to adopt, as the only though desperate remedy for an otherwise incurable disease; it is an operation, however, to which he would not be warranted in urging a patient to submit.

In all spontaneous aneurysms in the axillary portion of the brachial artery, ligature of the vessel above the clavicle is the proper remedy. But it may be the surgeon's duty to cut down into the axilla, and to tie some portion of the artery, on account of hæmorrhage from wound, or from solution of continuity caused by sloughing or ulceration. The upper, and more especially the lower, portions of the vessels may be included in a ligature with great facility. The middle portion is, in its natural state, so involved with the veins and nerves, that it can be got at with difficulty; but, in such cases as require operative procedure, this would form no objection to the application of ligature. To expose the axillary artery immediately on the distal side of the clavicle, it is necessary to divide the pectoralis major to some extent, and to separate its fibres from the bone. An incision is made immediately under the bone, from near its sternal end, to the space betwixt the pectoralis major and deltoid. The muscular fibres are cut through to the same extent, the cephalic vein and thoracio-acromialis artery being drawn to the outer side, and protected by a copper spatula. The cellular tissue and fascia are then carefully divided, the vein is drawn towards the chest, the upper end of the pectoralis minor is dissected a little downwards, and the needle passed. The lower third of the axillary portion of the brachial lies very superficially, and can be reached by abducting the arm, at the same time supinating and bending the fore-arm; by these means the nerves will be put less upon the stretch. An incision of about

three inches long is made upon the plexus of nerves and vessels, the fascia covering them is divided, and the median nerve and axillary vein are separated and held aside by narrow bent spatulæ. The artery, so exposed, is freed by the point of the knife from its accompanying veins on each side, and tied. Of course, in such operations the application of two ligatures will be made, when both ends of the artery are open, in order to prevent the occurrence of hæmorrhage when the collateral circulation becomes fully established.

The humeral artery may require deligation on account of wound in the upper-arm, or it may be proper to arrest the circulation through it, in consequence of aneurysm of considerable size at the bend of the arm. Disease in the coats of the arteries of the upper extremity, to a great extent, is not common, and very few cases of true aneurysm lower than the axilla are either met with in practice, or mentioned in surgical works. Accordingly the surgeon will seldom be called upon to perform any operation for spontaneous aneurysm,—from disease of the coats—at the bend of the arm. I have treated but one such case; it occurred in the person of an old ship's carpenter. Whilst at work as usual, he felt something snap in his arm; a pulsating tumour was soon afterwards noticed, and before I was asked to see him by Mr. Cheyne of Leith, it had attained, during four months, fully the size of a hen's egg, and was evidently in part composed of solid matter. The brachial was tied, and everything went on favorably.

Ligature of the artery in the middle of the arm is also the most advisable practice for aneurysm at the bend of the arm, the consequence of careless venesection,—when the tumour is of some standing, has attained considerable size, and has become, to a certain extent, incompressible. Ligature of the brachial, in this situation, is not so easy as a young surgeon might suppose from observing its very exposed and superficial position. The skin should be freely divided over it, on the inner side of the belly of the biceps; the fascia is opened at the same time, to the extent of at least three inches; the branches of the internal cutaneous and median nerves are avoided and pulled to the inner side, the fore-arm being bent so as to relax them; the ves-

sel is then exposed and separated from the accompanying veins. In performing this operation, the surgeon must have a full recollection of the varieties in the distribution of the arterial branches in this situation,—such as its high divisions; and he must assure himself, before permanently tightening his ligature, that he has got it round the vessel that is implicated in disease. The consequences of transfixion of the median basilic vein, accompanied with punctured wound of the artery, vary according to the steps taken immediately after the occurrence, and according also to the size and direction of the opening in the artery. If the puncture in the artery is longitudinal or slightly oblique, and methodical pressure is made upon it with a sufficient degree of firmness, as described at p. 202,—the fingers and fore-arm being previously bandaged, as represented at p. 65,—the probability is that the openings in both vein and artery will close, and the continuity of the vessels not be destroyed. The same favorable result may occur in mere puncture across the course of the artery; but if the vessel is cut half across, or more, effusion of blood externally and into the cellular tissue may be prevented, but the pressure must be very well applied indeed, and long continued, to prevent the formation of aneurysm, and, if it do succeed in this, the canal of the vessel must be certainly closed.

False aneurysm is the most common form of disease following accidental wound of the artery at the bend of the arm. As here seen, the vein is stretched over the fore part of the sac,—com-

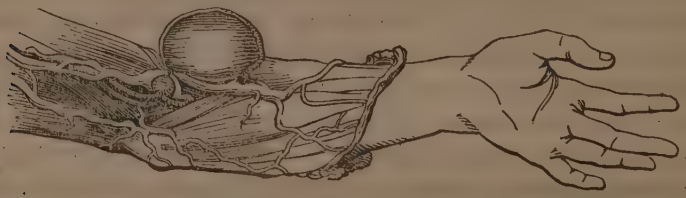
pressed, and perhaps obliterated. The cicatrix appears stretched and thin on the surface of the tumour, and there is sometimes a degree of blue discoloration around. The progress of the tumour is steady and uninterrupted, until operative procedure is resorted to. When the swelling is yet recent and small, and

quite compressible, when it disappears entirely on arresting the circulation, I prefer, and should advise, that the artery be cut upon and tied above and below the opening; as this will certainly be more successful than ligature of the vessel above, in this stage. I have been obliged to resort to the former practice in cases where the humeral had been previously secured on the proximal side, and when that had proved insufficient to cause coagulation in the sac, in consequence of the free anastomoses. In the bend of the arm, the vessel is very near the surface, and is easily reached by a superficial incision made on the ulnar side of the biceps and its tendon; in doing so on the dead body, the veins and branches of the cutaneous nerve can be dissected and avoided; but when the operation is required on the living, the parts are displaced and matted together, the vein is attached and incorporated with the sac, and no dissection of the coverings of the tumour is admissible or advisable. An incision in the course of the vessel is at once made into the sac, and beyond it, on both its proximal and distal side, to the extent of nearly three inches. The circulation is commanded by an assistant, who presses with his fingers on the brachial. The opening in the vessel is soon made to show itself, when the cavity is sponged out. A probe is passed upwards into the opening, and a little dissection of the sheath and venæ comites will then enable the surgeon to pass a ligature under the vessel, where its connexions are undisturbed. The same process is followed in regard to the vessel below the opening; there is no risk of interfering with veins or nerves, large or small.

If the artery happens to be wounded in opening a vein at the bend of the arm, there is a chance of a communication remaining between the two vessels, when the accident has either not been noticed—the flow of blood not being impetuous and per saltum, the opening being probably small, and the direction of the artery, and the ordinary figure of 8 bandage having been applied lightly, as after ordinary venesection; or when the existence of wounded artery has been known, and inefficient means adopted to restrain circulation in the part of the vessel implicated. The opening in the external aspect of the vein, and in the integument, closes as usual; no extravasation takes place

betwixt the vein and artery, and their coats become firmly agglutinated. The opening of communication is soon rounded off, is perhaps slightly enlarged, and becomes permanent. The arterial blood is poured into the vein, at each contraction, in a small and forcible stream, occasioning a peculiar thrill and sound; the veins appear to be over-distended, and, for a time, there may be slight swelling and discoloration of the limb. The inconvenience arising from this state of matters is trifling, and soon ceases to be felt; no interference is necessary. This is aneurysmal varix.

But aneurysm may form in communication with the vein; and two cases of this kind are recorded—properly termed varicose aneurysm, a disease oftener talked about than understood. This form is treated in the same way as the false aneurysm, by ligature either at the wounded part, or in the middle of the upper part of the arm, according to its degree of advancement.



An attempt has been made, in a recent theoretical work on surgery, to show that this form of aneurysm arises always from wound of one of the venæ comites, and the details of a most complicated and tedious and unsuccessful surgical operation are brought forward to corroborate the opinion. The writer pretends to great research, and seems, after all, very innocent and unacquainted with well-known cases. Necessity for ligature of the brachial may also arise in consequence of wound of the palm, involving the deep or superficial palmar arches, or on account of spontaneous aneurysm in this region; the latter,

however, is a most uncommon circumstance. My friend Mr. Grainger, of the Borough-school, mentioned a case to me which had come under his notice; and his colleague, Mr. Pilcher, who indeed had the principal charge of the patient, has been kind enough to favour me with some memoranda concerning it.

Case.—"A working goldsmith, about forty years of age, of a gouty diathesis, had a tumour formed beneath the ball of the right thumb; it had been mistaken for an abscess. On careful examination, I discovered it to be an aneurysm, and believed it to be situated between the adductor pollicis and abductor indicis, and to be a disease of the radial artery at its terminal division, probably induced by repeated, though slight, blows from the handle of the hammer which his occupation constantly obliged him to use. I proposed to tie the radial and ulnar arteries immediately above the wrist, provided the ligature around the radial alone proved ineffective in diminishing the tumour and arresting its pulsation. My expectations were realised; closure of the radial artery was attended with diminution in the size and pulsation of the tumour, but still both remained stationary at rather less than half the previous degree. I immediately tied the ulnar, when the tumour was much reduced in size, and the pulsation completely arrested: slight secondary hæmorrhage occurred from one of the arteries, at the seat of the ligature, two or three days after the operation, but was checked by cold water; the case progressed without any further untoward symptom, and was attended with a perfect cure."

Here success followed ligature of the radial and ulnar, but there was a risk of the tumour continuing to be filled with fluid blood through the interosseous. Had such a case been presented to me, I should have had recourse to ligature of the humeral low in the arm; and even now, after knowing the successful result of Mr. Pilcher's practice, it would be a matter for consideration, whether or not one operation only,—and one which would, for a time, effectually weaken the circulation in the principal vessels,—should not be preferred. Of course, when the division is high, the branches must be found, and tied above the bend of the arm; for this purpose, the same incision as that already described will suffice.

Recent hæmorrhage from the palm must be commanded by ligature applied to the divided ends of the vessels—these having been exposed, if need be, by dilatation of the wound. If the bleeding has been at first commanded by pressure, as when but small twigs are implicated,—and blood bursts out impetuously again and again, after the tissues have been altered by inflammatory swelling, abscess, and infiltration of blood,—then, should the clearing out of the wound, and methodical pressure from the bottom of the cavity, not prove effectual, recourse should at once be had to the operation on the brachial. There is no use in trying to tie the vessels of the palm, even were it possible to reach them easily and safely, for their diseased coats will not retain the noose; neither can ligature on the radial and ulnar be relied upon. Pressure on the vessels is sometimes resorted to in such cases, applied so as to operate upon their course, part of the circumference of the limb being uncompressed. Ring tourniquets, as they have been called, are invented and sometimes employed for the purpose; but the veins cannot entirely escape obstruction, and the effect of this upon the diseased parts must be obviously injurious. The practice is a remnant of the old and barbarous surgery; and though sometimes it may be successful by chance, yet, if generally employed, it must lead to mischief in the deep parts, bones, and joints; and besides, dependence cannot be placed upon it for a cure. Ligature of the vessel, under very unfavorable circumstances, might, after all, be called for, or even amputation of the member.

The radial and ulnar arteries may be the subject of injury and operation in various parts of their course. When wounded, —the opening in the coverings being free, and the hæmorrhage profuse,—the ends may at once be pulled out and tied. Should the external wound have been closed, and aneurysm formed, the tumour will probably not be permitted to exceed a filbert or small walnut in size, before assistance is sought for. The tumour in that case is to be opened by free incision in the course of the vessel; hæmorrhage being commanded by the pressure of an assistant on the brachial, the vessel is, by careful dissection, exposed above and below the opening, and tied at these points. I have secured the radial and ulnar in all parts of their course for

small aneurysms. In such proceedings, anatomical knowledge does assuredly avail much; but no regular dissection,—turning aside the nervous twigs, and cutting the sheath on a director, as described in the various manuals of operative surgery,—can ever be observed in actual practice; he who puts faith in what is taught by writers and professors, who have learned their surgery only in the dissecting-room, will find himself very much at a loss how to act when cases are presented to him, demanding these irregular operative proceedings.

The radial artery may be the subject of operation, as it passes on the dorsum of the hand, betwixt the metacarpal bones of the thumb and fore-finger. The incisions are made upon the ulnar side of the extensor of the second joint, and the vessel is tied either above or below where it is crossed by the tendon. In truth we have no choice as to the point of deligation, for we have absolutely nothing to do with these vessels, in surgical practice, unless when wounded, and then only at the wounded point. In making the incisions, and in separating and tying the vessel, care must be taken to avoid parts of importance, not detaching the artery from its connexions further than to permit the application of the ligatures, and including nothing but the vessel,—certainly neither the accompanying veins nor nerves. At various points on the thenal aspect of the fore-arm, the radial artery must be exposed, in consequence of injury. The skin and fascia are to be divided very freely; at the lower part, the incision is carried on the radial side of the flexor carpi radialis; higher up, the deep incisions must be guided by the ulnar edge of the supinator radii longus. The deep fascia is cut open, the sheath of the vessel is exposed, and the veins which invest the vessel,—and one of which often lies on the fore part,—are separated. The musculo-spiral nerve, lying behind, is scarcely in the way. The injured part of the vessel can thus be reached, at any point, without much lesion or disturbance of other organs.

The ulnar artery may be tied as it lies on the fore part of the wrist and palm inside the pisiform-bone, and also before it dips to meet the other vessels under the palmar aponeurosis—either on account of bleeding, primary or secondary, or when it is the

subject of false aneurysm. In the latter situation I have had occasion to tie the vessel more than once. It is readily reached in the fore-arm, by cutting freely along the radial side of the flexor carpi ulnaris; the ulnar nerve, easily recognised, is detached as much as sufficient, and held aside. The needle may then be passed betwixt the artery and nerve, from the ulnar to the radial side. Near the elbow-joint, the vessel lies deep, and can only be reached by cutting the muscular fibres, and detaching the connexions, of the flexor carpi ulnaris and flexor digitorum. Should the ulnar artery be here wounded, the probability is,—owing to its great depth, and the nature of the coverings,—that the blood would not escape freely, and that a circumscribed false aneurysm would form; but I am not aware of any such accident having ever occurred. The prudent practice would be, to permit the aneurysm to attain considerable size and consistence, and then to secure the humeral portion of the brachial. This proceeding would .be less severe than cutting up and crippling the muscles of the fore-arm, and in all probability would prove quite successful. I have had occasion to tie the ulnar rather above the middle of the fore-arm, and there it can be reached without much difficulty.

The aneurysms of the groin and hip were looked upon as mortal and irremediable affections, like those of the neck and axilla, until my excellent preceptor and friend, Mr. Abernethy, and after him Dr. Stevens, showed that the Hunterian method could be applied even to them. It is indeed true, that the late Mr. John Bell, an admirable surgeon, had previously with great skill and boldness put a ligature round the gluteal in a most formidable case of false aneurysm. This practice, however, would not have been applicable to aneurysm arising from degeneration of the coats of the vessel, it being impossible to say whether or not they had given way within reach from behind; and very few would have been found possessing sufficient courage to repeat the operation, even in a more favorable case than that which occurred to Mr. Bell. The common, internal, and external iliacs are now tied without much difficulty, and very often with a successful issue. These operations are quite justifiable, provided always there has been no mistake in diagnosis, and

that there is nothing in the state of the patient's health, or in the condition of the arterial system, to contra-indicate interference. In order to reach these vessels, the abdominal parietes should be divided down to the peritoneal sac, so as to afford sufficient room for the application of the ligature, and at the same time with as little cross-cutting of muscular fibres and disturbance of parts as possible. The faint-dotted line, on the right side of the sketch, marks the course of the first cut; on the opposite side the peritoneum is separated, and

held aside by a spatula, along with the abdominal parietes, so as to expose the vessels,—the common, external and internal iliacs lying upon the psoas muscle. The incision, through the skin and superficial abdominal fascia, should pass from over the vessel, as it lies under Poupart's ligament, upwards and somewhat outwards, crossing in a slight degree the fibres of the tendon of the external oblique. These are separated, as few being cut as possible; and the fibres of the internal oblique, which here descend, as well as those of the lower border of the transversalis, are also divided with great caution, the finger and forceps being used in raising

them slightly. The passage of the cord, where the travsverse fascia is thinned and continued over that body, is carefully opened, and the finger insinuated gently between this layer and the peritoneum. The layers may be cut upwards and outwards, to the full extent of the external wound; and, by moving the fingers in the loose cellular connexions, the inner margin of all is drawn towards the mesial line, together with that part of the peritoneal sac which is separated from the iliac fascia. In getting to the bottom of the wound, great assistance will be derived from the use of the copper spatulæ already spoken of and recommended. They form flat, blunt hooks of any curve; occupy no room, compared to the fingers of assistants; and by their pressure prevent the oozing from small branches. The same direction of incision, somewhat extended, will enable the operator to reach the internal iliac, as it lies over the sacro-iliac junction; or the common trunk is easily found by tracing the external iliac upwards; to get to the latter vessel, the incision should be free, its length depending on the corpulency and size of the individual,—say from four to five inches. An incision of six inches, well placed, will enable the surgeon to reach either of the other two vessels with facility; as he will find by experiment on the dead body. The external iliac is at once exposed by opening the fascia transversalis, and detaching the peritoneum slightly, at what used to be called the internal abdominal ring, outside of the spermatic cord. The division of the deep layers, so as to leave the peritoneum sound, is the most difficult part of the operation, and requires great deliberation and steadiness. The membrane is very loosely connected at the point indicated, the transverse fascia is delicate; and, in all the incisions of the parietes, whatever vessel it is necessary to secure, this is the point at which separation of the membrane from its investing sheath should be commenced. The artery is easily detached from the vein, which lies on its inner and posterior aspect, by a slight scratch with the point of the knife, so as to permit the introduction of the needle, which is then brought up on the outer side. The ligature may be passed round these vessels, and secured, by the fingers and common aneurysm needle,

but it is well to be provided with the needles and serre nœud already described. The object of the incision having been effected, it is put together by a few points of suture, the limb and abdominal parietes are relaxed by position, and the temperature of the limb is attended to and preserved by proper coverings, but not excited.

The common femoral artery may require ligature on account of wound. Its superficial and exposed position, and its connexion with no important organ, save the vein, render its exposure and inclusion in two ligatures easy enough. It has been tied for iliac aneurysm. In one such case it was found that the canal of the vessel had been previously closed by firm coagulum, and contracted in size. In all cases the ligature of the external iliac would probably be much preferable to that of the common femoral; as, from the proximity of the origins of the epigastric and circumflexa ilii arteries to the deep vessels of the thigh, but little space is afforded for the formation of a clot, and secondary hæmorrhage is a frequent occurrence. The proceeding is not likely to be again put in practice. The superficial femoral is perhaps more frequently the subject of operation than any other large vessel; it is very often exposed and tied, on account of aneurysm in the lower part of the thigh, or in the popliteal space; it was to this vessel that the immortal Hunter first applied his principle of interrupting the stream of blood,—so as to divert it into other channels, thus permitting consolidation of the tumour,—in preference to opening the sac, and attempting to include the vessel in ligatures at the "bursten point." This latter operation had been extensively practised, but with very bad success; so discouraging, indeed, were the results, that many surgeons preferred performing amputation of the aneurysmal limb. The natural obstacles occasioned by the relative position of parts, and the depth of the vessel in the then bent position of the limb, were as nothing in comparison to the risk attendant upon making the incisions in altered parts, and the difficulty of finding a sound portion of vessel to include in the ligature. It is not to be wondered at, then, that, almost without exception, the patients subjected to this proceeding perished either from

gangrene of the limb, or from secondary hæmorrhage. But the operation of Hunter, modified and extended by the distinguished men who have imbibed his principles, and followed in his track, has led to many of the most brilliant triumphs in surgery. The aneurysms situated in the lower third of the thigh, where the vessel penetrates the tendon of the adductor magnus,—as well as those in the ham,—are readily got rid of by the simple and beautiful proceeding of exposing the superficial femoral by a trifling incision, and tying a fine thread around it;—a proceeding which need not occupy, in the majority of cases, above a couple of minutes. The incision varies in extent, from two and a half to four inches, according to its depth. The vessel may also require to be tied on account of wound, or recent false aneurysm, in any part of its course; and, moreover, it may be proper to have recourse to the operation, in order to weaken the circulation of the limb, in cases of alarming secondary hæmorrhage from unhealthy solution of continuity in the lower part of the limb, or from stumps in which the process of cure is interrupted.

The superficial femoral artery is exposed by an incision, carried along the inner border of the sartorius muscle, in the inferior apex of the triangular space formed at the top of the thigh. The point of election for securing the vessel is where it begins to be overlaid by the muscle, the edge of which is the best guide. The skin and fascia may be cut through in the first incision, or the fascia may be first exposed, and then opened to a certain extent, by the point of the knife, with the hand unsupported. The sheath of the vessels is soon brought into view, some twigs of the crural nerve lying on the fore part, and the vein situated on the inner and posterior aspect. The nerves are avoided, and with the point of the knife a scratch is made betwixt the artery and vein. The needle is insinuated gently betwixt them, or with proper care it may be introduced in the opposite direction with equal facility. The vein must be carefully avoided; if it should be wounded, gentle compression and position must alone be resorted to. Varieties have been met with here in the arterial distribution, and, though such exist very rarely, the same precaution is to be observed as formerly insisted upon,—viz. to ascertain the effect of pressure on the exposed vessel, upon the aneurysmal tumour, after the ligature is passed and before it is finally secured. Sir Charles Bell met with a double femoral artery in a case on which he operated, and the vessels and sac are preserved in the museum of University College. The vessel having been tied, and the pulsation in the aneurysm stopped, the wound is put together, and the position and protection of the limb attended to. It is well known that the temperature is increased for some time; that pulsation returns feebly after a few days, and generally soon ceases; that the tumour gradually disappears, and that the ligature is detached some time before the twentieth day. Mortification of the limb sometimes ensues, in which case immediate amputation in the middle of the thigh must be resorted to. It is not at all necessary to go above the part of the vessel which had been operated upon; for the supply of blood, though inefficient to support the vitality of the whole limb, will amply suffice for the stump. The pulsation returns at a later period in some cases, even at the end of many months,

and may gain strength. Pressure well applied, the lower part of the limb being supported, will generally answer the purpose of stopping the flow into the still unobliterated sac, and lead to consolidation of its contents and their ultimate absorption. Secondary bleeding may take place on the separation of the ligature,—even though applied well and carefully, and without any unnecessary disturbance of the parts. In such circumstances, the patient must still be afforded another chance, by free exposure of the vessel above and below the seat of the original operation—an incision being carried through the cavity in which it lies surrounded by coagula, and re-application of a ligature effected on each portion.

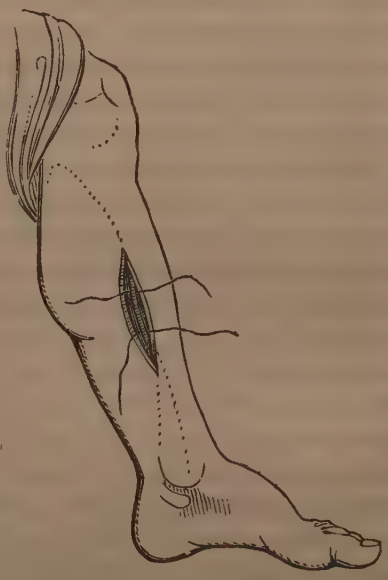
During the last fifty years, the popliteal artery has very rarely been made the subject of operation; it is not exposed to injury, and when diseased, as already stated, is in a most unfavorable condition to be interfered with; even in its sound state it is reached with difficulty. When it is thought advisable to secure the popliteal, the operation may be performed by making an incision four inches in length, commencing over the semi-tendinosus muscle about three inches above the centre of the popliteal space, and continued downwards through the middle of the ham. The skin, cellular tissue, and fascia, are divided. The tendon of the semi-tendinosus should then be exposed, and the incision continued deeply along the inner border of this muscle, and the semi-membranous; the sides of the incision being held apart, the operator should seek for the artery in the cellular tissue, a little external to the semi-tendinosus, and on a level with the upper edge of the patella. The vein is first exposed lying a little external and in front of the artery. It may be held lightly aside by a copper spatula, and the cellular tissue, which unites it closely to the artery, being scratched with the point of the scalpel, the aneurysm needle is passed from without inwards. The sciatic nerve need not be exposed during the operation. My worthy colleague, Mr. S. Cooper, with the able assistance of my then house surgeon, Mr. Duncan, lately cut into the popliteal space, and put a ligature round this artery, on account of secondary hæmorrhage from the posterior

tibial, which had been tied several times, but without permanent closure; the hæmorrhage did not return after the last operation, and the sore healed: the case is mentioned in Mr. Cooper's "First Lines." In a similar case I should prefer, as more simple, and likely to be more certain, the application of a ligature to the superficial femoral, in the situation already indicated.

The anterior and posterior tibial arteries must be tied occasionally, above and below the wounded part, on account of hæmorrhage (as in case p. 187) or small false aneurysm. The remarks regarding injuries of the upper extremity apply with equal force here. The anterior tibial, in the lower part of its course, lies very superficially; it can be exposed by an incision, of two inches in length, through the skin and subjacent fascia, on the fibular side of the extensor proprius pollicis,—betwixt the tendon of that muscle and those of the extensor communis digitorum; the branches of the peroneal nerve are avoided in passing the ligatures. On the fore part of the leg, the vessel can be reached with ease by an incision along the former muscle, betwixt it and the tibialis anticus. Still higher, it is found betwixt the belly of the extensor communis digitorum and that of the tibialis anticus, by which it is deeply covered. The venæ comites are of course excluded from the ligatures. The muscles should be relaxed after the first incision through the skin and fascia; and the higher the point at which the vessel is to be exposed, the longer must be the incision,—say, from five to six inches.

The posterior tibial may be exposed, as it lies in or above the hollow of the os calcis, by an incision betwixt the malleolus

internus and the tendo achillis. The artery is found accompanied by veins, and the tibial nerve lies on its posterior aspect towards the tendo achillis; the tendons of the tibialis posticus, flexor communis digitorum; and flexor proprius pollicis, lying nearer the bones, bound down in their sheaths; the last-mentioned tendon is somewhat nearer the point of the os calcis, than the sheath of the vessels and nerve. The artery is carefully separated from the other parts, and tied secundum artem. In order to reach the vessel high in the leg, a very free division must be made of the parts behind the tibia; the incision will pass betwixt that bone and the edge of the gastro-cnemius, which is raised and pulled aside; the origin of the solæus from the tibia is cut loose, and the deep fascia divided; the vessel will be found accompanied by the nerve on its fibular side, lying on the belly of the tibialis posticus muscle, and nearly midway betwixt the two bones. The peroneal artery may be exposed, if the necessity occur, by a very free incision on the outside of the limb, betwixt the fibula and the tendo achillis, and the muscles which terminate in it; the belly of the flexor proprius is pulled aside outwards,—or separated from the bones,—and the vessel secured. It has been proposed to remove part of the fibula in order to facilitate such operations; but, by cutting the soft parts to a sufficient extent, such a proceeding is rendered quite unnecessary.



WOUNDS, DILATATIONS, &c. OF VEINS.

Solution of continuity in the coats of veins is attended with flow of dark blood, often profuse, but not impetuous; it is

arrested by position, by raising the bleeding point above the level of the trunk, and by gentle pressure either upon the part or on its distal aspect. The venous branches in the lower limb sometimes give way, having become enlarged so that their valves cannot act, and been deprived of support by destruction of the skin. The consequence is a rapid and great loss of blood, with syncope: but the flow ceases on raising the limb, and is not renewed when reaction is established, if the patient be kept recumbent; the same results are observed when veins are opened accidentally, and in some of our operations.

Dilatation of the trunk and branches of veins,—with difficult return of the blood, congestion in the capillaries, and thickening and alteration of tissue, ending often enough in abscess and ulceration,—results from various mechanical obstructions, either external or internal. Such affections are rare in the upper extremity, though I have seen a few cases following violent muscular action. In the lower extremity,—and at the outlet of the pelvis, around the lower bowel and genito-urinary organs of both sexes,—such congestions are common enough, and lead to many diseases, which will be noted in succeeding chapters, as demanding operative assistance. Many of these may be prevented, relieved, or removed by timely attention to, and abstraction of, the cause; and this removal is sometimes very possible, even when the cause is situated internally. Many such affections, below the knee, are either caused or continued by external pressure, or the use of tight ligatures; and sometimes, in hospital-practice, this is found to be done intentionally.

Wounds in veins close readily, and without the deposite of much new matter; when in the direction of the vessel, and not extensive, they adhere at once: if extensive and transverse, so that there is some gaping, the opening is filled with coagulum projecting both towards the canal and outwardly; this is to a certain extent diminished by absorption, and latterly is invested by a thin layer produced from the coats of the vein, and somewhat strengthened by the condensation and adhesion of the cellular tissue. A vein, divided across, is closed at both ends by the formation of coagulum and deposite of lymph, but not to the extent observed in the other system of vessels. The closure is

sometimes slow and imperfect; and when matter is formed either on a surface or in the tissues around the opening, it is apt to be taken up and conveyed into the circulation by the open vein. When mixed with the blood, the pus is deposited in various situations, as in the substance of internal viscera, in muscles, and in joints. This accident is accompanied by a train of alarming symptoms, almost without exception ending fatally. The coats of veins do not furnish the same quantity of plastic matter as do those of the arteries, nor is it so necessary for their reparation; but, in consequence of injury, they are subject to diffuse inflammation, often extending rapidly along the internal coat, and attended with alarming constitutional disturbance. The local results are plugging of the vein by clot and lymph, secretion of purulent matter within their canals, deposite of thin putrid fluid in the investing cellular tissues, erysipelas, and gangrene. Violent and alarming irritative fever attends upon these, and too often terminates in the death of the patient. In our operations, lesion of veins is to be scrupulously avoided; and when it does take place the bleeding must be permanently arrested, if possible, without ligature.

The most simple and trifling wounds of veins are, in some states of the atmosphere and conditions of the system, followed by phlebitis, always a very intractible disease; this must be kept in view, in deciding upon our operative proceedings, and in determining the mode of conducting them. Every one looks upon himself as competent to undertake operations upon veins, and assuredly they are easily enough executed; indeed, if one can say so, they are by much too simple, and are consequently resorted to for want of consideration, or to give time for it, in by far too many instances. They are properly performed for the purpose of diminishing the quantity and impetus of the blood, or of altering its quality. In acute cases instant relief follows the practice; the structure of parts is preserved, and consequences dangerous to life averted. In many cases, however, of a different character, much more harm than good results from the abstraction of blood; congestions are thus increased, and effusions encouraged; and after severe injuries, the power and elasticity of the system are too often destroyed, and life

extinguished by a rash, thoughtless, and unseasonable use of the lancet. A practitioner ought to think twice on the probable and possible effects in every case of disease or injury, before he determines upon and proceeds to open a vein for the purpose of draining off the vital fluid.

The superficial veins about the ankle are sometimes opened, with great advantage, in order to give relief in some affections of the female genital organs. The flow of blood is encouraged by position, and by immersion of the limbs in warm water. The veins of the scrotum are sometimes also opened, with good effect, for acute inflammatory swelling of the testis. Blood is occasionally taken from the system, by opening the external jugular vein. It is practised in children, in whom the veins at the bend of the arm are small, and often concealed by fatty matter. The practice is also, though rarely, adopted in the adult on account of head affection. The necessity for the practice having been clearly made out, the operation can be accomplished without much trouble. In children, the vein rises during expiration, and in screaming; it can also be made to appear under the thin coverings of skin and cutaneous muscle, by impeding the return of blood by pressure. The thumb of one hand is placed above the clavicle, and, with a lancet held betwixt the fore-finger and thumb of the other, an opening is at once made in the coverings and coats of the vessel: the point of the instrument is placed on the skin, (the middle, little, and ring-fingers resting on the neck, so as to steady the hand,) and made to enter by pushing it steadily, but quickly, forwards, in an oblique direction; the opening in the skin and muscle is enlarged by raising the instrument perpendicularly, and then cutting a little in withdrawing it; the object being to make the wound somewhat of a funnel shape, the apex terminating in the vein. The operations upon veins, or in fact upon any part, must not be effected by a random thrust of the instrument. A puncture can always be made quickly and with comparatively little pain, yet at the same time with steadiness and precision. The quantity of blood having been obtained, the pressure below is removed, and the edges of the opening brought together by a narrow strip of isinglass plaster.

At the bend of the arm, the median cephalic vein is the one generally sought for, as being removed from the course of the brachial artery. But this venous branch is often small, and cannot be made to rise sufficiently on interrupting the flow of blood towards the heart by pressure, and forcing the blood from the deep veins by making the patient throw his muscles into action. In that case the median basilic must be opened, but with due caution; and this is done every day without any bad consequences. Puncture of the artery does not happen in one case out of many thousands, in which the vein—directly over it, and almost in contact,—is opened. The various consequences of this mishap have been already explained and shown. Provision having been made for receiving the blood, and other arrangements completed, the arm is tied up; that is to say, a band, ribbon, garter, or bandage, is passed round the upper arm, about two inches above the elbow; the middle part of it is placed on the anterior aspect of the limb, and the ends are brought round and secured by a running noose. It is drawn with sufficient tightness to obstruct the return from, but not the flow of blood into, the limb. This must be looked to: otherwise, after the branches below the ligature have poured out their contents, no more will be obtained, unless the band is sufficiently relaxed. The position of the patient will depend upon circumstances, on the nature of the disease or injury, and on the object the practitioner has in view in taking blood. The surgeon capable of using either hand will place himself in front of the patient: in operating on the left arm, he will place the thumb of the right hand firmly on the vein, below where he proposes to make his incision, and holding the lancet in the left hand, as formerly directed, he will make the opening obliquely across, of the form and extent already indicated. This done, the pressure of the thumb is removed, and the stream directed into the cups or platter held under the arm. The limb is preserved in the same position as when the vein was opened, during the flow of blood, otherwise this may be interrupted by the skin sliding over the opening in the vein. The flow is encouraged by motion of the fingers, as explained above; and this is generally insured by giving the patient some body, as the lancet-case, to grasp and

turn in his hand. The proceedings are reversed on the opposite side. The surgeon will be regulated in choosing the arm for venesection, by the position of the patient and the size of the veins. When the blood has flowed sufficiently, the band is removed, the thumb is placed either below or over the opening, the arm is washed and dried, and the aperture closed by a bit of plaster; or if the bleeding still persist, a small graduated compress is put on, and retained by putting the band round the elbow in the figure of 8 fashion, knotting it, if need be, or turning one end through the loop of the other, and over the compress; this pressure is maintained for twenty-four hours at least.

Extravasation of blood, thrombus as it is termed, follows this operation when imperfectly performed,—when the openings in the vein and skin do not correspond, or are not properly proportioned. Abscess in the cellular tissue may follow ragged wounds, or those made by instruments either in bad order or soiled with putrid matter. The wounds of tendons do not deserve notice, nor even those of nerves; the former can scarcely be injured in the operation, and if they were, would not, in all probability, lead to any bad consequence. Partial division of branches of the cutaneous nerves has given rise to painful feelings in the limb, and to general disturbance of the nervous system. But such occurrences are rare; they may be treated by general means, or, if need be, the original wound may be slightly enlarged. No regular dissection at the bend of the arm, as has been proposed, can ever be warranted. Benjamin Bell would have us almost sever the extremity by incisions through fascia, muscles, and tendons, even to the periosteum, in search of nerves supposed to have been injured in venesection.

Dilatation of veins has been treated by operations of various kinds, intended to cause obliteration of the trunk,—so as to take off the weight of the column of blood from the ramifications, and thus free the patient from the deformity, swelling, ulcerations, and other annoyances, consequent upon that condition of the circulation of the part. It was the practice at one time to cut upon the saphena vein on the inside of the knee, or thigh, and after dissecting it from the accompanying nerve and cellular investments, to put a couple of ligatures upon it, and cut it across;

this was doubtless a very effectual way of stopping the current of blood in either direction, but was so often followed by a speedy and permanent arrest of the general circulation, that it could not be persevered in; very many patients perished, in consequence of inflammation of the veins thus induced. The vessel has been cut across, by introducing a narrow knife at some little distance from it, without any division of the superimposed parts,—and pressure afterwards applied. This plan, proposed by Sir B. Brodie, and somewhat modified by a Dublin surgeon, Mr. O'Farral, has succeeded in some instances. The vein may be tied, without division of the skin, by passing a long fine needle under it, and applying the twisted suture. The needles should be introduced in pairs, at the distance of half an inch from each other, so as to favour coagulation in the intermediate portion. After the introduction of the needles, coagulation of the blood in the vessel between them takes place, then some inflammatory action is set up, opposite to where pressure is created by the needles, followed by effusion of lymph and closure of the tube. If the needles are removed when coagulation alone is produced, the blood will be found in a short time to penetrate the vessels as before the operation. It is necessary to excite a sufficient degree of inflammatory action, and they should therefore be retained seven or eight days, if the patient does not suffer from any symptoms of the inflammation extending up the leg. They should not be allowed to ulcerate out, but the longer they are retained, should no untoward symptoms forbid it, the more certain will be the cure. I have had recourse to this method in an immense number of cases, and with the most favorable results. Lastly, the vein has been obliterated by the application of the lapis infernalis, as recommended by Mr. Mayo. A bit of paste made up of potass with soap is applied: or a piece of the potassa fusa, of the size of a split-pea, is put upon the skin over the vein, where it is tolerably sound,—covered by a small piece of dry lint, and confined with a strip of common adhesive or soap plaster. In a few hours this application is removed, and the water-dressing substituted, as recommended at p. 20, and more fully described at p. 238. The eschar, which has reached the vein, separates after a short time. The vessel is

found to be condensed above and below; the sore heals; and permanent closure, attended with diminution of the varices, is the ultimate consequence. In order to effect this end perfectly, it is occasionally necessary to produce obliteration of the lesser saphena vein also, as it passes towards the popliteal space. The process is not attended with much pain, and there is no great risk of inflammatory action spreading along the coats towards the heart. The inflammation excited is of the adhesive kind, and attended by deposition of fibrine, which is speedily organised so as to close the canal. I have seen but one case in which the action was diffused: the patient, advanced in life, and of broken constitution, was treated by one of my colleagues in the Edinburgh Hospital. He perished apparently in consequence of the practice; but it was not a fair case from which to draw conclusions unfavorable to the method.

The patient must be confined strictly to the recumbent position, during and after separation of the slough, and until the breach of surface has become well filled up by granulations, and consolidated. By a neglect of this precaution, patients have lost blood to an alarming and dangerous extent. One stout young woman, to whom I had applied potass for the purpose here indicated, chose, contrary to orders, to get out of bed, and remained in the erect position for some time. She was found in a state of syncope, and deluged with blood; she recovered from this, and in order to prevent a recurrence of hæmorrhage, and induce again the adhesive process, the exposed vein was touched with a small cautery; pressure was at the same time applied, the patient kept recumbent, and the limb elevated. I have heard of similar instances occurring, and it will be always proper to impress upon the patient the risk of attempting the erect position, for a certain period after this method has been employed. And even after operations for the cure of varix, if the patient is obliged to stand much, or keep the lower extremities constantly dependant, it will be necessary as a precautionary measure to apply the laced stocking or bandage. The blood circulating in the smaller veins will distend them, and, if exposed to the same exciting causes, fresh varices will be produced. Upon the whole, I should be induced to give a preference to the

sutura circumvoluta, as already described—when from the uncomfortable state of the limb, and the occupation of the patient requiring long persistence in the erect position, it is desirable to relieve the varices from the pressure of a great column of blood; more especially when the limb has become swollen enormously, and ulcerated; and when, notwithstanding methodical support, hæmorrhages have occurred from the ramifications of the veins implicated in the ulcerated surface. In most cases of varix in the branches of the saphena veins, removal of the cause,—as accumulations in the lower bowels, and tight ligatures,—together with the employment of uniform support, will render the patient comfortable, and do away with the necessity for any operation whatever. A laced stocking, or a piece of fine and pliable India-rubber bandage, now manufactured in great perfection, may be worn outside the under clothing; when so applied, it does not slip down, nor does it fret the skin.

[It is affirmed by M. Davat, who has given much attention to operations upon the veins, that the passing of a needle beneath the vessel, and applying a twisted suture above it, is not, in the generality of cases, sufficient to produce permanent obliteration of its cavity. To procure this, the internal coat of the vein must be in some degree divided, and its sides kept in contact long enough to admit of the deposite of coagulable lymph. His mode of accomplishing this end consists in passing a needle through the skin, anterior and posterior parietes of the vein, after which it is pushed upwards and forwards, in such a way as to cause it to re-appear at the surface, a little above the place of insertion, after a second time passing through the sides of the vessel. The needle is then fixed in this situation by means of a ligature drawn tight enough to keep the opposite sides of the vein in contact with each other. This operation is simple, causes but little pain, and has generally proved free from danger. Dr. Fricke, of Hamburg, practises a modification of Davat's method, which he strongly recommends, and affirms to be equally safe. It consists in passing a needle and thread through the dilated veins, and allowing the thread to remain for twenty-four or forty-eight hours, according to the degree of re-action produced.]

CHAPTER VII.

ON INJURIES AND DISEASES OF THE INTEGUMENT AND CELLULAR TISSUE.

The greater number of accidental wounds involve the skin, cellular tissue, and fatty matter only; they more rarely penetrate the fascia, or implicate the muscles. The skin is often stripped from the subjacent parts to a considerable extent, and this is accompanied by breaking up of the cellular connexions, and by laceration of small arterial and venous branches and nervous twigs. The skin may thus hang loose to some extent; or the manifest solution of continuity may be small, whilst, by the forcible detachment, a large cavity is left all around,—the skin having been made to slide, as it were, to an unnatural extent, on the subjacent parts. This injury is uniformly and speedily followed by effusion of blood: and may be termed a compound bruise; the simple variety consisting in the same sort of detachment without wound. The progress of the two cases is generally very different. In the mere simple bruise, as already explained, the blood coagulates in part; but it is still somewhat under the influence of the containing tissues, does not lose its connexion with the system entirely, and, if not interfered with, is generally removed in a short time by the action of the absorbents. In the other case, the air being admitted to the cavity, coagulation, almost immediately followed by putrefaction, ensues; and the extravasated blood, acting now as a

foreign substance, must be extruded. Suppuration, at first unhealthy, bloody, and ill digested, is established for this purpose. The surgeon will encourage this; and may be called upon to give free exit to it, by enlargement of the wound, or by formation of a fresh dependent counter-opening. The more or less bruised nature of accidental wounds, and the unfavorable direction of most of them,—as stated in Chap. II., where the management of recent solution of continuity in the covering of the body is fully treated of,—very much diminish the probability of union by the first intention. The gaping of transverse wounds in consequence of the contractility of the skin in the direction of the body and limbs, has already been alluded to.

In accidental wounds, the part implicated is to be relaxed, and displacement remedied by position; any flap, so formed and reverted, is replaced and retained by the mild and unirritating isinglass-plaster; a stitch may sometimes be inserted; or a compress and bandage, applied slackly, may be used for the purpose of keeping the parts somewhat in their relative situation; but any attempt to pull them into closer contact, and keep them so, in the hope of union taking place, is futile; in fact, the use of any retentive means ought to form an exception to the general rule which should guide our procedure. The sooner discharge is established the better; lint dipped in cold water may be applied for a few hours till the oozing has ceased, and then heat and moisture are substituted with the view of promoting secretion of pus, soothing the painful and uneasy feelings, and preventing extensive swelling. A poultice may be used, but it is, from its weight and stench, always a filthy and uncomfortable application; what is much better, equally efficacious, and not liable to objection in any way, is a double piece of lint soaked in hot water, of an agreeable temperature; having been applied to the part, it is covered by an ample piece of oiled silk, to prevent evaporation; and this dressing, simple, yet answering every purpose, is removed frequently—the lint being moistened by merely removing the oiled silk, if the parts are very tender, and if it be not soiled by discharges; all the soothing effect of a poultice is thus produced without any discomfort. This warm water dressing is light and comfortable, and may be changed

often if there be any unpleasant odour exhaled; it may be medicated with extract of poppies, or salts of opium; or it may be coloured, and have some aromatic added, if the patient does not put faith in simple means. A great deal has been said of late about water-dressing, and the merit of introducing it; but in truth, water has been applied to sores from time immemorial. From a very early date, the simple element, water, was supposed to be congenial to wounds and sores, and was used to cool parts. The water-dressing has been used in hospitals under my charge, and in my private practice, for a long series of years, as a substitute for poultice,—as a means of conveying and preserving heat and moisture, on a surface that should secrete pus for its protection, and as encouragement to the process of healing by the second intention. A poultice—the very name of which is associated with putrefraction and nastiness—has very seldom been employed, either in my hospital or private practice, for the last ten or twelve years; in fact, our nurses at the North London have now almost forgotten the mode of performing the abomination. The question has been suggested,—How long does a poultice continue to be the bland, inoffensive, and soothing epithem as when first applied? I am prepared to answer,—Only for a very short period after application. So soon as the surface becomes clean, effused blood is discharged, sloughs of cellular tissue or skin have separated, discharge is copious, thick, and bland, and granulations are threatening to become large,—then some astringent must be added to the water, at first cautiously and in small quantities, so as to moderate discharge and keep the granulations in check; such as a lotion containing nitric acid, port wine, tincture of kino, or the sulphates of zinc, iron, or copper; in short, any vegetable or mineral astringent. The lotion most commonly used, and which has superseded the healing ointments, which have now become very scarce, and are used only to issues and other sores which it is not desirable to have closed,—is one recommended by that very admirable surgeon and exemplary man, Mr. Hey, primus, of Leeds, for the injection of strumous abscesses:—℞. sulp. zinci ʒj. spir. rorismarini ʒiss. spir. lavandulæ c. ʒss. aquæ ʒxxx; m. ft. lotio. This red lotion, as it is called, I am now in the habit of adding to

tepid water, in the proportion, at first, of one part to three or four, and gradually increasing its strength. This cautious procedure is adopted, lest the discharge should be suddenly suppressed, and inflammation of the surface of the sore ensue, marked by a white adherent crust, and by acute pain in the part; if this unfortunately should arise, the warm water is forthwith to be resumed, and perhaps some general antiphlogistic means adopted. Thus the greater number of solutions of continuity can be brought into the state of simple purulent ulcer—a sore which is disposed to heal speedily. This desirable consummation will be much encouraged by guarding against any congestion in the part, and by favoring the return of its blood—as can always be effected by proper position. The healing of sores is also much influenced by the age of the patient, the state of his health, and the situation of the breach of surface, as regards its vicinity to the heart. It is often necessary to vary the application to a sore, as it may become stationary under the use of any one mode of dressing; the state of the system also may require revision, and there is no such index of the condition of an individual as the surface of a sore—as has been already noticed. An experienced practitioner can learn more from that source, than from any examinations of the pulse or tongue, secretions or excretions; not that attention is to be wholly diverted from such means of information. The stomach and bowels may require to be put into good order,—so improving the nature of the circulating fluid, and the functions generally of the animal machine. The granulations may become too high and exuberant, as is often the case when poultices and greasy applications have been long persevered in; and then, the process of cicatrization cannot proceed. A good mode of preventing, or even repressing, such a state of the surface in the first instance, consists in dressing with dry lint and bandage; very narrow slips of old linen or cambric, spread with cold cream, or some mild and recent ointment, such as the unguentum cetacei—are first placed on the margins of the ulcer; a piece of dry lint doubled is applied over all, and retained by bandage; or a bit of finely pierced pledget (old thin linen perforated by many holes, and thinly spread with unirritating ointment) is placed on the raw

surface, and this again is covered with a layer of charpie or soft lint. If this does not suffice after a fair trial, the sulphate of copper should be rubbed on effectually, and once for all. Very exuberant granulations may sometimes be shaved off by the rapid stroke of a thin and very sharp knife, with less pain than attends their destruction by escharotics.

I am no advocate for meddlesome surgery,—such as the constant use of caustics, and the unceasing probings of wounds, abscesses, and sinuses. Nature, well and judiciously assisted, will generally bring matters to a speedy and happy conclusion; and ought not to be thwarted, tampered, and interfered with, as is too often done by those who still try to cure all diseases and injuries by the pure force of surgery. Nevertheless, we must endeavour to bring sores into that state in which cicatrization can take place; this process is equally interrupted by the surface being raised above, or depressed beneath the level of the surrounding skin. When the surface is elevated, that state must be corrected at once, and not by constant and painful interference with stimulants and astringents. The sulphate of copper is the most efficient for this purpose, and should be applied for some minutes without intermission, as already advised. It is not necessary to rub over the whole surface of a large sore; the application must be confined to the granulations next to the margin. Time is thus given for the adoption of other means, as the dry dressing and pressure, to suppress exuberance of the remaining part, whilst cicatrization goes on from the circumference. Cicatrization, it is well known, often proceeds from points in the centre of a sore,—from portions of skin that have not been destroyed throughout its whole thickness. When a portion of skin is entirely removed by accident or design, such an appearance is rare. A well-marked case of the formation of new skin, independent of the old, occurred a short time ago in the North London Hospital. A man had the whole integument stripped from outside his leg; the muscles were completely bare. In the course of the cicatrization of the wound, new skin formed immediately over where the muscle was even stripped of the fascia. It occurs during the healing of very deep breaches of the surface, but these have been produced by

burn, or by ulcerative absorption following abrasion or abscess, or injury of some sort, or arising in consequence of the weak, obstructed, and imperfect state of the circulation. The depth of such a sore is often more apparent than real. The reparative process has, perhaps, been interrupted; granulations have been absorbed, or have sloughed away from improper dressings; if on the lower extremity, probably long persistance in the erect position has proved deleterious; the surface has become smooth, and furnishes no great quantity of discharge: the surrounding cellular tissue is infiltrated by fibrinous effusion, as well as by albuminous serosity; the skin is thickened and opened out in its texture, rough and elevated. The surface may inflame, and will then furnish a bloody and putrid secretion; it may become deeper and more extensive by ulceration or sloughing; and it may be in this state, or after the loss of considerable quantities of blood from dilated veins ramifying in the vicinity, that the patient applies for relief. He has been living irregularly. He has been obliged, perhaps, to undertake a journey, or to be otherwise longer than usual in the erect position, and he finds that he cannot continue his exertions, on account of the aggravation of the disease. Such affections are met with only in the lower extremities of the laboring classes, and a great many individuals are so disabled. The excited condition of the parts, and the foulness of the sore, are first to be corrected; this is done by attention to the digestive organs, by elevating the limb above the level of the trunk in the recumbent position, and by direct soothing applications. The bread and water or linseed meal poultice, the carrot poultice,—if there be much sloughing or fetor, and the practitioner or patient have any faith in them,—or the warm water dressing, medicated or not, may be used. When the sore has become florid and clean, the object must be to bring its surface on a level with that of the surrounding parts. Granulations cannot be made to grow by any known application; the surface has begun to furnish them, but the void cannot thus be filled up entirely by new matter. The swelling caused by infiltration of the subcutaneous tissue, and of the skin itself, is to be got quit of; and this is speedily effected by methodical compression, the position favorable to

return of blood being still observed. It is in these depressed and indolent sores that Baynton's bandage, as it is called—the method so indiscriminately employed by the Messrs. Scott,—is of the utmost advantage. In applying this, the lower part of the limb, the foot, heel, and ankle, must be supported by bandage. But this is seldom done very satisfactorily, and the art cannot be acquired without a good deal of practice, and without following a proper method. The end of the roller, having been placed on the inner malleolus, is carried under the heel and round the ankle once; then it is passed over the foot, close to

the root of the toes, and by two or three turns brought up to the ankle again, over the point of the calcaneum—being reversed under each malleolus, and then turned round the heel in both directions. It is impossible by words to explain this, but it is here shown in two stages of the proceeding. The bandage is carried up nearly to the lower margin of the sore, in order to prevent subsequent swelling, which might lead to the necessity of removing the whole dressing. If this preliminary step (no part of Baynton's or Scott's method by the way) be neglected throughout, whilst tight pressure is made round the limb above, troublesome swelling and even ulceration about the ankle will certainly ensue. Another mode of bandaging the foot, represented in the next page, is much in vogue in Paris, and is very useful when, from œdematous swelling or other causes, it is desirable to give firm support to the parts about the ankle joint. The bandage is first applied round the foot, beginning near the roots of the toes; after making two turns in this situation, it is carried along the inner side of the foot just over the point of the heel, then along the outside of the foot, and over the dorsum, a

little above where the last turn round the foot was made; it is turned under the foot, again over the dorsum, and brought round the heel above the last piece of bandage; and by a continuation of this manœuvre, the bandage forming a figure of 8, carried gradually higher on the dorsum of the foot, and above the heel, until it passes up the leg, the whole of the foot and ankle is covered in. The last two turns round the ankle require a reverse to be made on the outside. When the ankles is covered in, the bandage is carried round the leg as usual. The parts round the sore having been thoroughly washed with soap and water, and dried, are encircled by strips of adhesive plaster, about an inch and an eighth, or an inch and a half broad. The middle of these strips, heated, are placed on the opposite side of the limb, and the ends laid across the sore. If there is much discharge, it is advisable to cut a small hole in the plaster where it is to cover the ulcer. The strips of plaster are carried from an inch or so below the

sore, to the same distance above; some tow is placed on the dressing to absorb discharge, and is retained by a few turns of the roller. This dressing is removed at the end of twenty-four or forty-eight hours, according to circumstances; and when this is done, the purulent secretion is to be removed from the sur-

rounding skin, by means of a little tow dipped in tepid water. If there is threatened excoriation, soap and water, or spirit lotion,—say one part of alcohol to six or seven of lime-water,—may be also used; but on no account ought the surface of the sore to be mopped or wiped with sponges, or soused and deluged with water poured from a height. The secretion, acting as a cuticle, serves a useful purpose in protecting the part; and dreadful mischief, to say nothing of the pain, has resulted in hospitals from the absurd practice of removing it. Without doubt, the indiscriminate and indiscreet employment of sponges has often greatly contributed to the degeneration of sores, and the spread of contagious diseases,—such as hospital-gangrene, and erysipelas. In warm weather the patient will often find relief from soaking the limb, through the dressings and bandage, with cold water, as recommended by Baynton. So soon as the object for which this dressing has been applied is attained,—the thickening having disappeared, and the surface of the surrounding skin come to a level with that of the ulcer,—when, in fact, the sore has been brought into a simple and healthy condition,—then the dry dressing, or the lotions as recommended, may be substituted; but if the sore continues to heal rapidly under the plaster, and the patient feels comfortable, it may be continued with propriety. When it has nearly closed, all dressing may be discontinued,—the discharge on the surface being allowed to dry, and form a crust, under which, if it adhere, cicatrization will be completed; or this may be accelerated by rubbing the surface lightly either with bluestone or the nitrate of silver. The elevated position of the limb is still to be preserved, however, and it will be advisable to insist on the patient afterwards giving support to the surface, more especially if the veins are enlarged, by the use of a laced stocking, or of the India-rubber bandage.

Many solutions of continuity in the cellular tissue and skin cannot be brought into a healthy condition until parts, the circulation of which is weakened, are divided or destroyed. The skin has been attenuated, and its vascular supply cut off, by displacement or destruction of the subjacent tissue; the edges of the sore are thin, and of a dark red colour; part of the cavity

is in a half-sloughy condition; the discharge is glairy and ill conditioned, and proceeds from various cavities communicating with the ulcer, and even from under the flabby granulations which in part occupy the void; and the surfaces are not in a state to coalesce. In these cellular tissue sores, that texture has been extensively diseased without the skin being involved in the same degree; and numerous openings may form in the skin through which the discharge issues. This state of matters is much altered for the better by the free application of the potassa fusa; by destroying the skin and the unhealthy cellular tissue, as soon as the slough separates, a sore will be left, which, by the application of warm water dressing followed by the zinc lotion, and by attention to the digestive organs and general health, will soon heal.

Sinuses form betwixt muscles, or the integument is occasionally deeply undermined by the long accumulation of matter. After the evacuation of the purulent secretion, these cavities will frequently heal without further trouble, or their cure may be hastened by the application of a compress and bandage over their track; but when they have continued long, and their sides are lined by a secreting membrane, pressure will have little effect. If the sinus be superficial, a probe-pointed bistoury may be introduced and the whole slit up; but if it be deep under the integument, or if, as I have seen, a sinus is found running from above the pubes to the perineum, and under the spermatic cord, the knife would be inapplicable; a stick of potassa fusa may be introduced, and allowed to remain a short time, so as to destroy the parietes of the sinus; and this, after the separation of the small slough it causes, will often be followed by a speedy cure.

Some ulcerations are disposed to spread superficially at one part, whilst they heal at another. The margin, when the ulcerative process is advancing, has an irritable and angry aspect; the edge is jagged and surrounded with diffuse redness to some distance; the discharge is bloody, thin, and putrid; the papillæ of the skin and the sentient extremities of the nerves are implicated, and hence arises intolerable and constant burning pain. These sores occur in different parts of the body, and generally several exist at the same time; they often follow scaly eruptions,

and are connected with a disordered and cachectic state of the system; that must be corrected, whilst the local affection is palliated, soothed, and brought into a more healthy condition. The nitrate of silver, applied lightly to the unhealthy margin at intervals, and the water-dressing, will often answer well. But it is out of place here to discuss the treatment of ulcers, or to enumerate all the local remedies that are now, or have been, used. Very many of these have been employed to solutions of continuity of every kind, and at all stages of their progess. A judicious practitioner will, by varying his applications,—the actions of which he has become acquainted with,—according to the appearance and disposition of the exposed surface, serve and benefit his patient much more efficiently than by trying, empirically, this or the other new specific,—or blindly applying one remedy for every sore, because he has seen its good effects, or been informed of its answering miraculously, in one or two instances. The same remark applies with equal force to the indiscriminate prescription and exhibition of internal remedies.

From the crowding of great numbers of patients in one ward in hospitals—in ill-ventilated and unhealthy situations—in particular states of the atmosphere, or when patients are exposed to unhealthy effluvia, ulcers, of whatever nature they may be, are liable to put on an unhealthy action;—they become red, irritable, and inflamed at their edges; these are everted; the discharge is sanious, thin, and offensive; the granulations, from being florid and small, become pale, flabby, and sloughy, and at last the whole ulcer is filled with an offensive, ashy-looking slough. It has no inclination to heal, and is constantly extending. In such cases the general health becomes soon affected; the patient is low, and has typhoid symptoms. Great care should be taken that no discharge from such wounds is communicated to any other branch of surfaces, as there can be no doubt that such diseases are contagious. In these cases, great advantage will sometimes be derived from slitting up the edges of the ulcer when much inflamed and tense, and completely destroying its surface by the free application of nitric acid to the sore: this is the application best suited to those cases in which it is advisable to destroy effectually, and with little pain,

the whole surface of an ulcer. Frequently after one free application of this escharotic, a healthy granulating surface will be left, which may be treated on the common principles of a simple ulcer. Treatment should be adopted for the constitutional symptoms; bark and opium, with occasional purgatives.

Foreign bodies, lodging in the cellular tissue, sometimes cause great pain and inconvenience, and give rise to a process for their ejection. Abscess forms, and progressive absorption brings the collection of purulent matter to the surface; from the cavity the foreign matter may at once be ejected, or removed by art; or it may be discovered, after a time, by an examination of the sinuous track into which the cavity of the abscess has contracted. Such is the process also, by which dead and useless portions of the machine are thrown out. In many cases, foreign bodies even of large size and irregular shape,—such as needles, pieces of glass, leaden bullets,—remain long imbedded in condensed cellular tissue, giving rise to little or no inconvenience, even for a series of years; often, however, they shift their position; they may be lodged deeply, and gradually come towards the surface; and they move from one part to another of the trunk or limbs. Instances of needles, which had fallen into the pharynx, appearing on the surface of the body, are not uncommon. Bullets which had lodged deeply have, after the lapse of years, appeared under the skin and been removed. When the presence of foreign bodies is distinctly perceived, they may be cut upon in the direction of the fibres, and turned out by the use of a scoop or forceps,—care being taken to avoid important parts. We are often called upon to remove needles from various parts of the body and limbs, either shortly after they have entered, or at a later period when they have become oxydized, and adhere to the surrounding and condensed tissue. Often there is a difficulty in feeling their situation so distinctly as to satisfy oneself of their presence. If there is any doubt in the mind of the surgeon, he had better not make incisions,—thereby subjecting the patient to unnecessary pain, and himself to the risk and disgrace of failure. No harm can accrue from small foreign bodies remaining, and the chance is that sooner or later they will become apparent, so as to be certainly and easily

removed. A very small incision will sometimes enable the surgeon to reach one end of the needle; it can then be pushed through the opening so as to be seized with the forceps,—the opposite extremity having been fixed by the fingers, whilst the incision was being made. When the point is unbroken, and the foreign body is recently and favorably lodged, incision is sometimes unnecessary; the head of the needle, or part corresponding to it, being pressed so as to bring the point through the integument. I have removed many needles from the upper extremity in this manner.

The mode of evacuating abscesses has been fully adverted to in a former chapter, and the propriety of making the openings free and dependent, in the direction of the fibres, was insisted upon; the mischievous effects of squeezing out the matter were also alluded to. There can be no greater cruelty or folly, than that of pressing together the sides of a suppurating cavity, to empty it of its contents; the surfaces are thus excited, air enters to fill the vacuum so caused, violent pain is produced, inflammatory action is lighted up, the discharge becomes vitiated, bloody, putrid and profuse, and the constitutioual disturbance is often alarming, and even fatal. One or more sufficient and well-placed openings are made at once, and discharge from them allowed to be gradual; a warm poultice of linseed or barley, or of bread,—soaked in hot water, covered for a few minutes, and not broken down,—is applied for a few hours; this is renewed frequently, but is soon abandoned for the elegant substitute for a poultice, the tepid water-dressing. The necessity for making incisions and counter-openings has also been fully noticed; as well as the mode of doing so, in order to prevent sinuses, and permit fistulous tracks to close. Free division of such canals is occasionally required, as when one side of a cavity is moveable and the other fixed; or when the action of muscles interferes with the process of contraction. After such incision, dressings,—such as lint smeared with ointment or oil, or dipped in water,—must be applied to the bottom of the void, and betwixt the edges of the recent division, and retained until discharge is furnished by their surfaces. Frequent repetition of such dressings, however, is not necessary.

The incisions for evacuation of putrid matter and sloughs, as in carbuncle, are suited to the particular case. They must be made free and sufficient, even by cross-cutting, for the purpose of exposing the unsound parts, so that proper applications may be made. But this is not a place to treat of the general management of such cases.

Great deformity is occasioned by the permanent displacement of parts, caused by the formation and subsequent contraction of cicatrices. The free motion of parts of the face, head, or limbs, is sometimes prevented by the contraction of scars, more especially of those extensive ones following destruction of the surface by the application of heat. The eyelids are often everted in consequence; and the eye, thus exposed, is liable to inflammation and consequent opacity. The under-lip is turned down; so that the saliva cannot be confined; the chin is tied to the sternum; or the head is fixed to one side by firm, white, and corrugated bands. The upper extremity is often so disabled; the upper-arm is confined to the chest, or the fore-arm is fixed to the upper-arm by a dense and unyielding web. Sometimes the hand is awkwardly twisted, and rendered comparatively useless. In some favorable cases, advantage may arise from division of such bands, or from removal of part of the cicatrix; and during the healing of such incisions, means are taken, by various contrivances, to keep the parts separated, and divert the renewed disposition to contract. There is no great encouragement to make such attempts, however; certainly no severe operation is warrantable; and, as already said, it is only in favorable instances, when the connecting slip is thin, and not extensive, that any permanent advantage can be expected from interference. The great object must be to prevent these adhesions as much as possible during the cicatrisation of the wounds. The limits should be kept extended. In burns of the hand, when the fingers are involved, there is a great difficulty sometimes in preventing the adhesion of the fingers one to the other. It is requisite in these cases to make pressure on the web between the fingers, by means of lint and a slip of bandage.

Various parts of the integument are subject to disease,—some not very manageable, even by the most persevering and judici-

ous general treatment. In inflammation of the skin, accompanied by infiltration into the cellular tissue and great tension, relief, in many instances, can be afforded, and destruction of tissues prevented, only by free incisions carried through the affected parts; in general, these consist of merely the skin and cellular substance; it is only in very aggravated or neglected cases, that the intermuscular tissue and deep parts are involved. The incisions are made where the tension is greatest; in advanced cases, the experienced surgeon will at once detect any situation where the cellular tissue is much infiltrated, broken down, and likely to be the seat of abscess or sloughing;—and that point he will choose for the site of his opening. One or two incisions, well placed and not very long, will generally suffice to afford relief and avert mischief. The propriety and good effects of this practice have been long appreciated.

In 1748, Mr. Freke, then surgeon of St. Bartholomew's Hospital, thus writes: "Scarifying the skin in a gangrene is a very idle practice, unless the surgeon, if he hath sagacity enough, when the membrane is not destroyed, but only ready to suffer, then cuts largely through both, and thereby lets out the inflamed juices which distended it, and by that means takes off the tension. In such an act he shows both judgment and resolution; such good treatment continued may cure the patient." Nothing can more clearly or more forcibly indicate this practice of incision,—not to evacuate the secretions or dead parts, after actions have been permitted so to terminate, but to avert the formation of matter and the accession of gangrene.

In many cases, when this practice is advisable, loss of blood cannot be borne to any extent. Care must therefore be taken, by position of the limb and gentle pressure for a time, to guard against excessive bleeding. Incisions will be required on the limbs, and trunk, or scalp, and their direction must always be the same,—that is, in the direction of the muscular fibres; their extent and number will be regulated by the nature of the case, the violence of the action, the degree of swelling and tension, and the period of the case. The incisions are best made by a broad bistoury, according to the rules already laid down. It was at one time proposed to employ the cupping-scarificator, for

the purpose of dividing the vessels on the inflamed surface; but this practice is not now followed. Many years ago, Sir R. Dobson, the able head of the surgical department at Greenwich Hospital, recommended the practice of making numerous punctures in rapid succession, with the point of a lancet. In the milder cases, where there is little or no infiltration into the cellular tissue, and in erysipelas of the face, where incisions cannot be practised with propriety, it is a proceeding which answers admirably; it entirely supersedes, in these cases, the very questionable mode of extracting blood by leeches. When advisable, bleeding from the punctures may be encouraged by making the part dependent, or, as when an extremity is affected, by interrupting the return of blood by pressure for a short time. Fomentations will always be found soothing and grateful, after both incision and puncture.

Some parts of the skin and cellular tissue are subject to hypertrophy. The follicles are distended, the tissues thickened, and the venous ramifications enlarged and loaded. The cellular tissue is infiltrated with albuminous serosity, which may continue for a considerable time, the legs being enormously distended. Such cases are relieved by raising the limb on an inclined plane, and bandaging very carefully from the toes upwards. Great attention should be paid to the state of the bowels in such cases.

More solid and organized deposite is found to have taken place in this tissue; but the supply of blood is not large in proportion to the bulk of the swelling. Enlargements of this nature occasion great deformity and annoyance. Temporary swelling and rugosity of the skin, from effusion into the cellular tissue, accompany disease of long standing in other tissues. But it is also met with, more especially in warm climates, as an idiopathic affection. The lower extremity and the scrotum are in consequence the seat of enormous growths; the Barbadoes and Cochin legs are of this nature,—affections sometimes, though very rarely, seen in the natives of this country. A similar swelling is met with in the external labia; and the disease is by no means uncommon in the coverings of the nose. The mode of freeing patients from such excrescences will be noticed in Chapter IX.

CHAPTER VIII.

ON RESTORATION OF LOST PARTS.

Surgeons are too often asked to admit that operations are the opprobria of their art; and, in one sense, there is not much room for dispute, when the "cruelties" practised are to save life by mutilation of the body. But even then, it is unjust to sneer at this department of the profession, as is done by some, affecting to consider the dexterous and successful operator as little better than a "clever butcher." For, at the worst, the operation is but the lesser of two evils; and the man who can skilfully avail himself of this choice,—saving life, though perhaps at the expense of pain and mutilation,—is entitled to esteem and honour, equally with the most refined and delicate conqueror of a fever or ague.

But when the object of the operation is not to mutilate but to repair,—not to deform, but to restore lost appearance and symmetry,—not to cripple or destroy, but to re-establish suspended functions and capabilities,—then the "deed of blood" is placed beyond the cavil of all whose opinion merits attention. To this happy class belong the topics now for consideration.

RHINO-PLASTIC OPERATIONS.

The nose is frequently destroyed in whole or in part, and from various causes—such as external violence, intractable ulceration in youth, syphilitic or mercurial ulceration, frostbite. In this country, ulceration is usually the destructive agent.

Such an accident, however occasioned, entails on the sufferer the utmost misery. The organ impaired being so prominent a feature, the unseemly breach is observed by all; the patient consequently shuns society and every appearance in public, and often is oppressed with a self-loathing and abasement, almost amounting to the blackest despair.

Were those who seem to despise the repairing of such deformity by surgical interference, holding it as a frivolity and little better than operative quackery, to witness the utter wretchedness of the mutilated object, and how eagerly he would cling to any hope, however slender, of bettering his condition,—prejudice against rhino-plastics would rapidly thaw before the warmth of aroused feelings of humanity. If not, put the scoffer in the place of the patient,—let him lose his nose, reputably or otherwise,—allow him some weeks of consequent misery and degradation,—then bring him in contact with a skilful and dexterous surgeon, who despises no part of his professional practice that is to benefit his fellow-creatures, and thinks it not beneath him to make noses as well as stumps,—and there can be little doubt that, ere long, the rhino-plastic art will have obtained an addition to the list of its supporters, of a sure and zealous proselyte.

It is not surprising that, at an early period of surgical science, attention should be turned towards repairing deficiencies of the nose; we are only astonished by the reflection, that it is comparatively of late that any decided approach towards perfection has been made in this department. The tardy progress is to be attributed partly to the apochryphal character which the first attempts acquired, and partly because the important doctrine of adhesion was for long but little understood or attended to.

The first recorded attempt at restoration of the nose was made by a surgeon in Sicily, towards the middle of the fifteenth century. At the time, it seems to have attracted some notice, and to have been followed by similar attempts both in Sicily and Italy. But comparatively little was known of any such proceeding till about a century later, when, under the fostering zeal of Tagliacotius, rhino-plastics at length attained celebrity. Tagliacotius and his followers, who were tolerably numerous, adopted without improving the old inconvenient method, borrow-

ing the repair from a distance, and consequently rendering the proceeding tedious, most annoying to the patient, and liable to failure. The integument and cellular tissue, necessary for their purpose, was usually taken from the upper part of the fore-arm; this substitute "was not applied immediately, but was detached gradually, and allowed to thicken and change its consistence, and to become more vascular, previously to adaptation to the mutilated organ. When considered sufficiently prepared, (seldom in less than fourteen days,) it was shaped so as to fit accurately, though still remaining attached at one point to the arm; the cicatrized edges of the deficient parts were then made raw, and the new substance was affixed by suture; the original attachment was preserved entire, and the patient kept in a constrained position, the arm and head being approximated and bound together by apparatus for many days, till union occurred; then the flap was separated entirely, and the new nose moulded into its proper form by subsequent paring and compression."—(Elements of Surgery.) Such is the practice of some of those who have performed this Tagliacotian operation of late years, and though inconvenient and tedious, yet it is founded on sound pathological principles.

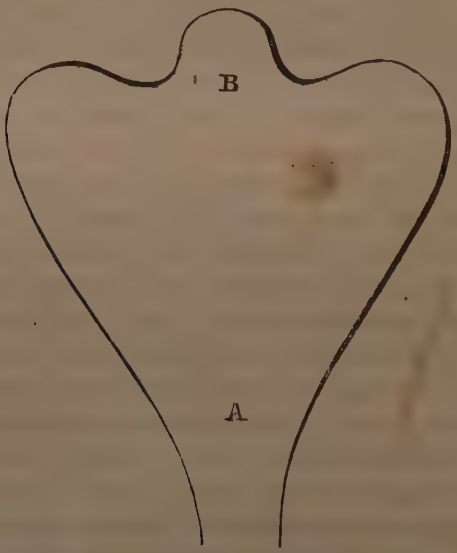
This mode of operation, with all its defects, struggled into notoriety; but no trial of it was made in this country. An unusual caution seemed to possess the Britons; for, even after their attention had been directed to the subject, the whole was treated with ridicule, and regarded as fabulous. Handled with the licentia poetarum, and dressed in an extravagant though less decorous garb, its improbability has, by Butler, been made a point of keen and humorous satire in the imperishable "Hudibras." But, though inaccessible to innovation of this nature from the continent, they did not neglect similar results of experience communicated from a more distant clime.

In India, during the war with Tippoo Saib, in 1792, several individuals, who had been cruelly deprived of their noses during captivity, had that organ restored, successfully and dexterously, by a Mahratta surgeon. This led to inquiry; and it was discovered that the operation had been practised in that country, "from time immemorial," chiefly by the Koomos, a caste of Hin-

doos, whose dexterity and success cease to be matter of wonder, when we consider the ample practice they enjoyed,—the system of punishment incidental to the country supplying them with numerous patients. Their mode of procedure was very different from that of the continental surgeons; they obtained the substitute from the immediate neighbourhood of the lost part,—from the forehead. To Mr. Carpue our profession is indebted for the introduction of this operation, by his work published in 1814–15. Since then it has gradually gained ground, and is now of no unfrequent occurrence.

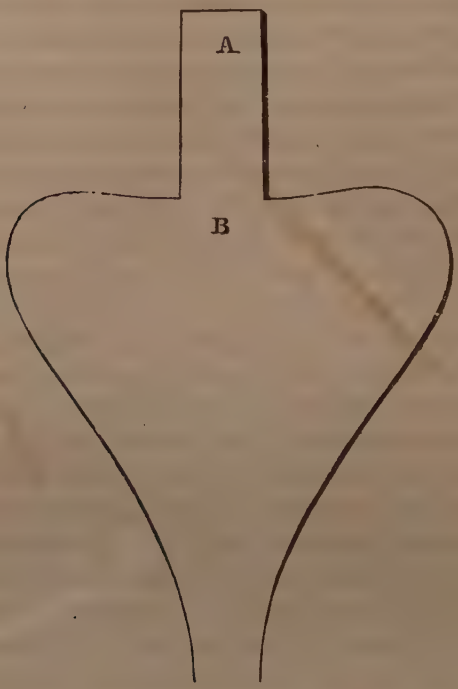
RESTORATION OF THE WHOLE NOSE.

The operation of restoring the whole nose, in substance the Indian, but modified, is performed as follows:—The cicatrized remains of the old feature are pared down to a considerable depth, to produce a raw surface on which to attach the flap from the forehead. A piece of soft leather, cut to the shape and size of the integument required to replace the apex and alæ, (see fig. below,) is placed flat on the forehead (A being between the eyebrows, and B towards the hairy scalp.) To secure ac-



curacy in the line of incision, its boundaries are marked on the skin with ink, in case the patient should prove unsteady. The flap, having been thus defined, is dissected down, and kept of uniform thickness, till near the lower angle, where the incision should be carried deeply, so as to ensure an abundant vascular supply. Care should be taken, however, to avoid the periosteum, otherwise exfoliation may follow, which would increase the scar, and render the cure tedious. This narrow part of the flap, or attachment, at the root of the nose, must be of some length, to allow of its being twisted so as to bring the integument to the exterior when the part is adapted to its new situation; and to facilitate this, the knife should be carried a little lower down on that side on which it is intended to make the turn. "After the bleeding has ceased, the flap is retained, in apposition with the raw edges of the truncated organ, by points of suture; a little oiled lint is placed in the nostrils to support the flap, but no other dressing should be applied. To cover the part with adhesive strap, and pledgets of lint smeared with ointment, can answer no good purpose, and the subsequent removal of such might endanger the adhesion."—(Elements of Surgery.) The surgeon should be in no hurry to fix the flap; for union is most likely to occur when bleeding has ceased, and the edges of the wounds have begun to assume the glazed appearance which immediately precedes secretion. The lower part of the wound in the forehead is brought together by suture; to the rest, lint moistened with warm water, and covered with oiled silk, is applied, the lint being re-wetted from time to time. Granulation soon diminishes the raw surface, and cicatrization is expedited by stimulating lotions suitable to the circumstances of the sore. As for the nose itself, "the lint may be removed in three or four days, and then, too, some of the stitches may perhaps be dispensed with. The flap will be found adherent, but loose, and raised by every expiration. Very soon granulations rise from the inner surface, the part derives support from below, and becoming firm preserves its form well. It will be necessary, during the cure, to keep the nostrils of their proper size and shape, by means of well-fitted tubes."—(Elements of Surgery.) When the nose is firmly consolidated, and has established a col-

lateral circulation, so becoming independent of the supply through the twisted attachment, this is divided,—a bistoury



being passed beneath, to remove a wedge-like portion, and so admit of the front being laid down smoothly over the root of the nose, where it is retained either by gentle pressure or by suture.

In this manner is restored the main body of the organ, consisting of apex and alæ. Now we have to turn our attention to their support, and subdivision of their front, by means of a columna. This the Indians obtained by bringing a slip of integument from the forehead, along with the rest of the flap, as represented in the plan above.

B forms the apex of the nose, whilst A is turned down and fixed to where the original column rested. Until lately, this mode of operation was pursued in this country; but it is liable

to much objection. In most cases, the hairy scalp must be interfered with, in order to obtain this part of the flap; and from its form and relative situation, when thus obtained, its vascular supply must be so impaired as to render its failure, in the support of its new character, not at all unlikely, by sphacelation; indeed this has not unfrequently happened. Besides, it has not sufficient solidity to support the apex of the nose; on the contrary, it bends, shrinks, and pulls the nose downwards. I have found it much better to divide the operation into two parts; first forming the main body of the nose, as already described; and after this has become consolidated and healed, then raising a columna from the upper-lip, as I have elsewhere described, thus:—

"Restoration of the columna is an operation which, in this and other civilized countries, must be more frequently required than the restoration of the whole nose. This latter operation came to be practised in consequence of the frequency of mutilations as a punishment; but the punishment for some of our sins is left to Nature, and she generally relents before the whole of the organ disappears. The column is very frequently destroyed by ulceration,—a consequence, as before stated, either of injury or of constitutional derangement. The deformity produced, by its loss, is not far short of that caused by destruction of the whole nose. Happily, after the ulceration has been checked, the part can be renewed neatly, safely, and without much suffering to the patient. The operation which I have practised successfully for some years, and in many instances, is thus performed. The inner surface of the apex is first pared. A sharp-pointed bistoury is then passed through the upper-lip,—previously stretched and raised by an assistant,—close to the ruins of the former columna, and about an eighth of an inch on one side of the mesial line. The incision is continued down, in a straight direction, to the free margin of the lip; and a similar one, parallel to the former, is made on the opposite side of the mesial line, so as to insulate a flap about a quarter of an inch in breadth, and composed of skin, mucous membrane, and interposed substance. The frænulum is then divided, and the prolabium of the flap removed. In order to fix the new columna

firmly and with accuracy in its proper place, a sewing-needle—its head being covered with sealing-wax to facilitate its introduction—is passed from without through the apex of the nose, and obliquely through the extremity of the elevated flap: a few turns of thread over this suffice to approximate and retain the surfaces. It is to be observed, that the flap is not twisted round as in the operation already detailed, but simply elevated, so as to do away the risk of failure. Twisting is here unnecessary, for the mucous lining of the lip, forming the outer surface of the columna, readily assumes the colour and appearance of integument, after exposure for some time, as is well known. The fixing of the columna having been accomplished, the edges of the lip must be neatly brought together by the twisted suture. Two needles will be found sufficient, one being passed close to the edge of the lip; and they should be introduced deeply through its substance—two-thirds, at least, of its thickness being made superficial to them. Should troublesome bleeding take place from the coronary artery, a needle is to be passed so as to transfix its extremities. The whole surface is thus approximated; the vessels being compressed, bleeding is prevented; and firm union of the whole wound is secured. The ligature of silk or linen, which is twisted round the needles, should be thick and waxed, and care must be taken that it is applied smoothly. After some turns are made round the lower needle, the ends should be secured by a double knot; a second thread is then used for the other needle, and likewise secured. With the view of compressing and coaptating the edges of the interposed part of the wound, the thread may be carried from one needle to the other, and twisted round them several times; but in doing this, care must be taken not to pull them towards each other, else the object of their application will be frustrated, and the wound rendered puckered and unequal. Last of all, the points of the needles are to be cut off with pliers. No farther dressing is required. As previously remarked, no good end can be answered by any application, and the removal of dressing may afterwards be troublesome; besides, discharges from the neighbouring passages are retained by it, fetor is produced, and union interrupted. The needles may be removed on the third day;

their ends are cleaned of coagulated blood, and, and after being turned gently round on their axis, they are cautiously withdrawn, without disturbing the threads or the crust which has been formed about them by the serous and bloody discharge. This crust often remains attached for some days after removal of the needles; and, besides forming a bond of union, is a good protection to the tender parts. Some care is afterwards required, from both surgeon and patient, in raising up the alæ, by filling them with lint,—thus compressing the pillar, so as to diminish the œdematous swelling which takes place in it, to a greater or less degree, and repressing the granulations. It is besides necessary to push upwards the lower part of the column, so that it may come into its proper situation; and this is done by the application of a small round roll of linen, supported by a narrow bandage passed over it and secured behind the vertex.

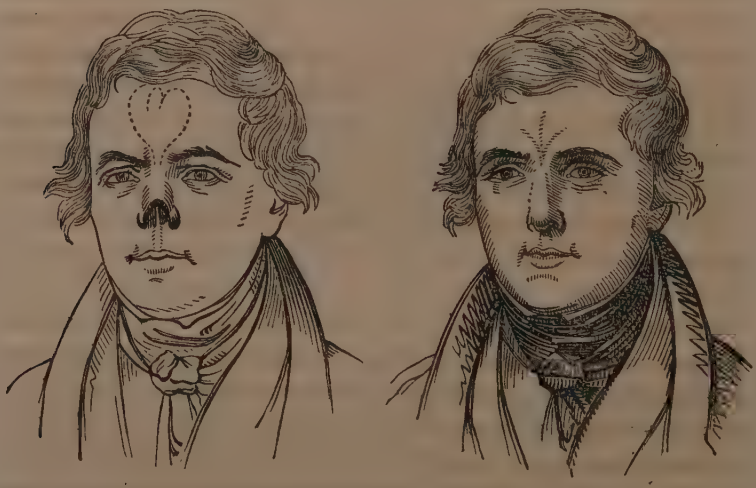
"Independently of the great improvement produced on the patient's appearance by restoring the lost part of so important a feature, it may be observed, that when the columna has been destroyed the lip falls down, is elongated, and becomes tumid, particularly at its middle, so that borrowing a portion from it materially amends the condition of the part; and the cicatrix, being in the situation of the natural fossa, is scarcely observable."—(Liston's Elements of Surgery.)

Thus is the whole feature restored. Some have lately proposed to assist nature by an artificial support of metallic construction, introduced and retained permanently within the nose. This, I fear, is but analogous to the insertion of metallic plates between the integument and cranium, after the operation of trepanning—alike opposed to the principles of surgery, and inconsistent with the results of experience. We must rest satisfied with the productions of nature; assisting her efforts by supporting the apex and alæ, until they granulate from below, and form a sure and well-cemented foundation on the ruins of their predecessors. After this, we require merely to preserve the form of the nostrils, by the insertion of two silver tubes, till cicatrization is completed, and contraction has ceased.

Such noses have been ridiculed, as flat and "dumpy." But, if properly constructed, though not in accordance with either

the Roman or Grecian contour, as their predecessors may have been, still they are noses to do well in the world. They are literally very passable noses; for many have I known to pass those of my own making, without remarking anything particular in the features of the wearers. And surely none can deny, that the worst made nose is infinitely superior to the horrid cavern, which previously struck the passer-by with pity and disgust. As a fair sample of the manufacture, I annex, opposite, representations of my first case, before and after operation.

It cannot be expected that the new formation is to inherit all the functions of the primary organ. The sensation of the interior is much less acute, and of a different nature; and, indeed, when handled, the sensation so occasioned may be referred to "the parent" breach in the forehead—though this is not by any means so common an occurrence as many assert. After a time,



however, the interior is lined with what resembles a mucous membrane, and exhales a mucous secretion. One of my patients I have seen enjoying a pinch of snuff, in which he largely indulged, apparently with as much gusto as the oldest and most experienced nose could possibly have imparted. But even should our constructions fail in this accomplishment, a nose is still a nose, "although there's nothing in't."

In one thing the surgeon cannot be too careful. When the organ has been lost by ulceration, he must be well satisfied that all tendency to return of the morbid action has ceased, before he ventures to affix a new and healthy substance, otherwise adhesion will fail; or ulceration will destroy, in whole or in part, what it was his object to raise perfect and entire. Care should also be taken that the patient be not exposed to severe cold, or even to much alteration of temperature, during the first part of the cure, the flap being for some time but feeble in its powers of vitality.

Very frequently the flap becomes of a blue colour, shortly after adaptation. This may arise from two very opposite causes; either from deficient influx of blood, producing the cold lividity antecedent to gangrene, or from more blood entering the flap than can be conveniently returned by the veins. It is important to distinguish between the two conditions, for it is very apparent that what would prove eminently of service in the latter case—taking away blood either from the raw edges of the wound, or by puncture—would, in the former, but hasten destruction of the part.

Another caution to be enforced is, that the flap with which the deficiency is to be supplied, should always be somewhat larger than would seem necessary from exact measurement of the parts; for, during cicatrization, and for some time after, the new formation shrinks and contracts; so that what would at first seem neat and exact, will be found shrivelled and insufficient; and what may in the first instance look bulging and clumsy, will soon subside into just and seemly proportions. To this it may be, as it has been, objected, that a large wound is made in the forehead, and must produce a corresponding deformity. But if care be taken not to induce exfoliation, if the parts be brought together neatly, so far as the form of the wound will admit—and if the remaining raw surface be treated tenderly and prudently, neither over-stimulating the part, nor encouraging exuberant and flabby granulation—all objections on that ground will be found irrelevant. Still, let it never be forgotten, that "sit modus in rebus." Let the operator beware of making

his flap unnecessarily large,—a practice which some surgeons have ventured to recommend, trusting that nature may in time smooth down the awkward repair into better uniformity with her own formations.

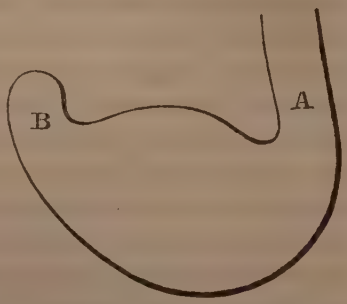
It is almost needless to state, that operations of this nature are more successful when the ossa nasi are entire, than when they too have been involved in disease, and either totally destroyed, or sunk and impaired. Also, we can more confidently anticipate and promise success, when the original organ has been lost by accident—as by sudden violence—than when it has fallen a prey to the ravages of disease.

RESTORATION OF PARTS OF THE NOSE.

When the nose has been partially destroyed, the operation for its removal is more simple and successful. The substitute part is derived either from the forehead or from the cheek, as circumstances may require.

Restoration of the ala.—When a portion of the ala is destroyed, as generally happens from accident, the deficiency is readily supplied from the cheek. The dimensions and form of the required integument having been discovered, by admeasurement with a piece of thin card, this is laid flatly on the contiguous surface of the cheek, and a corresponding portion, a little larger than the pattern, is then elevated; having been adapted to the deficiency, it is secured in its position by points of suture, the edges of the opening having been previously pared. When the twisted suture admits of application, it is to be preferred; for certainly, in such operations, adhesion occurs more readily with that form than with the interrupted. The wound of the cheek is also brought together and retained by suture; and in most cases, this can be done throughout its whole extent. After adhesion, the attachment of the flap is divided, as after restoration of the entire nose. During the cure great care is required in stuffing the nostril, so as to keep the new portion duly expanded, and prevent the falling inwards to which it naturally inclines, and which would certainly happen, were it left without support.

It is an advantage, in this operation, to adapt the flap without twisting the connecting neck; the coaptation is in consequence more exact, the supply of blood more free, and the vitality of the part less endangered. Thus, A the form of flap on the cheek, B the slip of attachment. It is very plain that by bringing A into a straight line with B, or a little more to its other side, the flap may be placed in apposition without any twisting of the attachment, the acute angle it previously formed having been entirely removed.



Cases.—Some time since, I assisted my friend and former colleague, Mr. Walker, in an operation for restoring part of the ala nasi, in which this form of incision and management of the flap was pursued. I had, also, more lately, a most satisfactory case of the same kind, in which the deficiency was much greater than in Mr. W.'s case, the whole of the ala and apex having been destroyed by ulceration. The deformity was very great, and very little remedied by a bit of a false nose which had been fitted to the void. The patient was almost obliged to give up his profession, and retire from the world. The cure was so complete, as regarded both the application of the flap and the union of the wounds, that he has again resumed his former station, and may pass muster anywhere without observation or remark.

When the ala is wholly deficient, the flap may be obtained from either the cheek or the forehead. If the cheek be full and flabby,—and admit of a sufficient extent of its surface being removed, without much subsequent stretching of the parts and deformity by extensive cicatrization,—the flap may be taken from this quarter in the manner already mentioned. But when the cheek is naturally spare and shrunk, such procedure would be but the production of one deformity to hide another; consequently the flap will, with more propriety, be brought from the

forehead. This is done in the same way as for restoration of the whole nose; but a variation is expedient when the organ is of unusual length. Then, the long and narrow connecting slip, if treated in the ordinary way, would be so indifferently nourished, and so ill supported, that the vitality of the transplanted part would be endangered. To obviate this, a deep incision is made along the ridge of the nose, continuous with the wound in the forehead at that side to which the twist is to be made. By a little dissection with the point of the knife, this longitudinal incision is widened sufficiently to contain the connecting slip from the forehead: and into the groove so formed, the slip is laid, and retained until firm union of the whole flap has taken place. When this has occurred, which may not be till after a week or two, the slip is again raised by incision, and cut off close to the adherent flap. The wound in the ridge of the nose is then united by suture.

Restoration of both alæ and point of the nose.—When both alæ, or when the entire tip of the nose, have been lost, restoration is made from the forehead in the manner just described. The flap and its connecting slip should be rather longer than might seem necessary, to allow for contraction, and care should be taken that the incisions in the ridge be not so deep as to endanger the vitality of the ossa nasi. When the nose is short, the nutritive sulcus may be dispensed with; in which case, the slip must be made broader than it would otherwise be.

Restoration of the ridge of the nose.—When the bones of the nose have been discharged either from accident or from disease, the upper part of the nose falls in; and if it should happen that the rest of the organ remains uninjured, the prominence of this renders the depression of the upper part, or ridge, still more marked or unseemly. It is out of our power to raise the sunk portion to a level with the point, but we can make it a raw surface, and on it engraft a sufficiency of new material, from the forehead, to restore the organ to its former proportions. The raw surface may be made in two ways; either by simply shaving off the surface of the depressed portion, and affixing the necessary quantity of borrowed parts; or by establishing a sulcus in its centre, as if for the nourishment of a connecting slip,

raising the integument a little on each side, and then inserting and permanently retaining a central portion, sufficient to raise the part to its proper level. The circumstances of each particular case will determine which method is preferable. The flap is brought from the forehead, twisted, and fixed in the usual way.

Depressions of the ridge, when of slight extent, may be removed simply by incision, without transplantation. When the nose is of great length, the depressed portion may be included between two transverse incisions, enclosing a wedge-like portion. The depression is thus cut completely out, and, on the edges of the wound being brought together, the ridge regains an even surface. If this be attempted with a short nose, the nostrils are turned up, and the organ acquires the character of a most unseemly snub. Another mode of incision may be adopted to prevent this; the ridge itself is not interfered with, but by plunging a bistoury through the nose, an oval portion is cut out by two elliptical incisions, one angle of the wound being towards the cheek, the other towards the ridge. By bringing the edges of this wound together by suture, the oval is brought to a straight line, the depression of the ridge is consequently raised, whilst at the same time the nose is not shortened, nor the nostrils altered in aspect. The surgeon must, however, beware of removing more than enough in this way, otherwise an elevation may succeed the depression of the ridge.

RAISING OF DEPRESSED NOSE.

Sometimes the cartilaginous portions of the nose fall a prey to abscess and ulceration, while the integument remains intact, —excepting the column, which usually shares the fate of the cartilages. The consequence is a sinking down into the nasal cavity. The depression may be obviated, by simply raising the parts, after dividing any adhesions that may have formed in their new situation. By stuffing the nose carefully and neatly, the integument is retained of a proper shape, until the disposition to fall is in part overcome, and firmness and stability obtained. Then a new columna is raised and fixed; and careful stuffing of the nostrils is continued until all has become consoli-

dated. By this simple proceeding, the appearance may be very much improved.

Dr. Dieffenbach, of Berlin, recommends a more formidable treatment of this deformity, cutting the depressed portion into triangular slips, paring their edges, and arching them on each other; retaining them by suture, and transfixing them with numerous pins, as means of support during granulation. This proceeding is both complicated and severe; the after treatment is in unison. The internal surface of the nostrils is to be "touched daily with caustic, and afterwards a luxuriant granulation is to be encouraged by means of red precipitate." In one case, "during the whole period of the treatment, the inner surface of the nose was diligently irritated, to promote granulation and thickening of the soft parts." In this country, few practitioners would advise such an ordeal; and as few patients would submit to its infliction.

CHEILOPLASTIC OPERATIONS.

The upper-lip seldom suffers in continuity, unless by congenital deformity, or by external violence, forming fissures, which are readily united and repaired without any intervening substance borrowed from the neighbourhood. (Vide Chap. XV.) The under-lip is occasionally destroyed by external violence, in whole or in part; but more frequently it falls a prey either to the ravages of disease, or to the operating knife or caustics applied for removal of disease. Loss of the under-lip, however caused, though not so palpable a deformity as destruction of the nose, is productive of more serious inconvenience. There is a constant trickling of saliva over the chin and neck, which not only irritates and excoriates these parts, but may materially weaken the system; articulation is indistinct; the teeth become coated with tartar; the gums recede, the teeth loosen, and the countenance is seriously deformed.

To remedy this condition, a flap is brought from under the chin; the dimensions necessary for supplying the loss of substance having been traced on the integument, the flap so marked is elevated by dissection, leaving a thick attachment of the symphysis menti. "The callous margins of the space formerly oc-

cupied by the original lip are pared, and the flap, having been twisted round, is adapted to the edges of the wound, and retained by points of interrupted or convoluted suture. To insure adhesion, the attachment at the chin should be left thick and fleshy, and the flap should not consist of mere integument, but contain no small share of the subcutaneous cellular and adipose tissues, in order that circulation may be vigorous in the part. The integuments below the chin are naturally loose, and consequently the margins of the wound there are readily approximated. The flap soon becomes œdematous, and may require support by bandaging. After adhesion has been completed, the attachment is divided, and as much removed, in a wedge-like form, as will admit of the lower part of the flap being laid down smoothly; it is then retained in close apposition with the subjacent parts, either by suture or bandage. In the adult, union may be retarded by the edges of the flap twisting inwards, and interposing their beard between the raw surfaces: when such is the case, the offending margins must be pared away."—(Elements of Surgery.)

When the lip has been lost, by operation for the cure of cancerous or other disease, the formation of a substitute should not be attempted immediately afterwards. The parts should be allowed to granulate, and so to repair the deficiency as far as they are able; and not until this reparative process of nature has ceased, and cicatrization commenced, should the surgeon's knife interfere. Then, the flap required will be much smaller than what would have been necessary to fill the gap, when first established. Of course, the cicatrized edges are made raw previously to adaptation. The following case may be given in illustration.

"Case.—A. Cowan, æt. 42. About six years ago, a small ulcer appeared upon the under-lip, accompanied by lancinating pain and induration of the adjacent parts. A shepherd applied to the sore a plaster, said to be composed of acrid vegetable matter. This had the effect of completely destroying the whole under-lip.

"When admitted into the Royal Infirmary of Edinburgh, on May 9th, 1829, under the care of Mr. Liston, the ulceration had

ceased, and the parts were cicatrized. The patient wore a leather bag under the chin, to collect the saliva, the flow of which caused great inconvenience. His speech was also distinct.

"May 10th.—To-day a new lip was formed. A piece of leather, of the size and shape of the under-lip, was placed under the chin, and a corresponding portion of the integuments was reflected upwards, a considerable attachment being preserved. The cicatrix was removed by the knife; and the flap, having been twisted round, was adapted to the edges of the wound, and retained by six interrupted sutures. A considerable quantity of tartar, which thickly coated the teeth, had been previously removed.

"May 16.—The sutures have been withdrawn.

"May 20th.—The flap is adherent, though somewhat swollen and œdematous, and is supported by a compress and bandage. The wound under the chin is cicatrizing rapidly.

"June 6th.—The flap has firmly united excepting immediately above the attachment, at which point a probe can be readily passed beneath it.

"June 7th.—A bistoury having been introduced beneath the non-adhering point of the flap, was carried downwards, so as to divide the attachment, which was then removed by a second incision. The lower part of the flap was laid close to the chin, and retained by a bandage.

"June 20th.—The whole of the flap is firmly adherent, but is still rather tumid. The wound under the chin is almost completely cicatrized.

"June 21st.—The edges of the flap, which were non-adherent in consequence of the hairs on their surface being twisted inwards, were pared, and a firm compress and bandage applied.

"July 8th.—The wound has wholly cicatrized. The patient speaks distinctly, and retains his saliva; and his countenance is much improved. Dismissed cured."—*Med. Gazette*, vol. iii. p. 347.

When only part of the lip has been lost, the flap may be applied without the twisting of its attachment, in the same way as directed for reparation of the ala nasi.

In operating for restoration of the lip, we must not be so sanguine of success as in similar proceedings on behalf of the nose, for failure is by no means unfrequent. Aware that the circulation could not be so vigorous beneath the chin as on the forehead, I was always careful to leave the attachment at the symphysis menti as deep and as broad as possible. Yet in more than one case has the flap perished, and apparently from insufficient vascular supply. Of this, however, we need hardly be afraid, when the flap is for only part of the lip, and is attached without any twisting of the connecting slip. Though the parts retain their vitality, union by the first intention seldom takes place throughout the whole extent of the wound, being prevented by the trickling of saliva between the uniting surfaces. Suppuration consequently is more or less general during the cure.

[Cases of contraction of the mouth, either congenital or produced by burns or vicious cicatrices, sometimes fall under the notice of the surgeon. Mechanical dilatation, and simple division of the commissures, followed by the interposition of plates of metal, or tents, between the edges of the wound, are the methods of treatment mostly resorted to in these cases, and opegenerally followed with but little permanent benefit. An are ration for the cure of this deformity, devised and executed by Dieffenbach, of Berlin, appears to be well calculated to remedy this state in all such cases where the mucous membrane covering the lips is in a healthy condition. The following is his mode of proceeding:—The patient being seated on a chair, with the head well supported by an assistant, the surgeon introduces the left fore-finger into the mouth, and with it renders tense the right cheek; with the other hand, one blade of a straight sharp scissors is made to enter between the mucous membrane and the other tissues of the cheek, a little above the commissure of the lips, and is pushed backwards until the end of the instrument reaches the point at which the operator has previously determined to place the new commissure. The parts included between the blades of the scissors are then cut, and a second incision, in every respect similar to the first, is made a little lower and parallel to it. The two incisions are then united at their posterior extremity by a small semilunar cut, and the little strip of flesh thus separated is dissected off, without injuring the mucous membrane lining the cheek. Similar incisions are then made on the left side of the cheek; after

which, the jaws are widely separated, in order to stretch, as far as possible, the mucous membrane of the mouth, which is thus exposed. This membrane is then to be divided into two equal parts, taking care, however, not to carry the division of it to the same extent as that in the integuments, but stopping within three lines of the new commissures. The wounds are afterwards carefully sponged; and when all hemorrhage has ceased, the flaps of mucous membrane are drawn out and placed in contact with the margins of the wounds to which they are to be united, either by points of sutures, or very fine hair-lip needles. The portions of mucous membrane near the commissures, which have not been divided, are to be the last secured. The points of suture should be sufficiently numerous to keep the edge of the mucous membrane in close contact with that of the skin, so that the whole of the exposed surface may be entirely covered by it. Union by the first intention most commonly takes place and the sutures or needles may be removed on the second or third day.]

OTOPLASTIC OPERATION.

It is impossible to restore the whole ear, or any large portion of it, in a satisfactory manner; but slight deficiencies admit of being well repaired by integument borrowed from behind, and applied either with or without twisting, according to circumstances. It is an operation seldom performed, and one which a surgeon will not urge; for in most cases, the actual deformity is but trifling, and, as in the lip, sphacelation of the transplanted part need not be matter of great surprise.

In all these operations on the face, there is no inconsiderable risk of erysipelas; and the surgeon must not only be on his guard against this untoward occurrence, but be prepared to treat it actively. To prevent it, as well as to promote adhesion, the wounds, as has already been stated, are brought together simply by suture; all heating and heavy dressings are avoided, and the sutures are cut out as soon as they can possibly be dispensed with. Notwithstanding these precautions, and attention to the state of the system,—particularly in securing healthy action in the primæ viæ,—should erysipelas occur, blood must be taken freely from the transplanted part, and its neighbourhood, by puncture,—in addition to the usual constitutional treat-

ment. If the attack be mild, it will yield to this treatment; but if infiltration be going on, or even threatened, recourse must be had at once to free incision, not only in the neighbourhood of the transplanted part, but in that part itself. At this the surgeon must not hesitate; for there is no risk, under the circumstances, of its vitality being lost in consequence of even very free incision; and it is now well known, that wounds in the transplanted parts heal with more rapidity than in the original formations. The incisions should be made at an early period of the accession, it being of the utmost importance to cut the disease short; for erysipelas, so induced, not only interferes with the process of adhesion, and endangers either partial or total sloughing of the part, but, as experience has shown, may terminate fatally.

Such are the most common deficiencies, which the surgeon is called upon to repair by borrowed integument. Accident or disease may so affect the other parts of the body, as to render reparative proceedings of a similar nature both warrantable and expedient. In such cases, the operator will be guided by the particular circumstances of each, as to the most eligible method of procedure.

CHAPTER IX.

ON MORBID GROWTHS AND ENLARGEMENTS.

Tumours are the result of an opening out, and addition to, original tissue,—a true hypertrophy,—or of a secretion and deposite of abnormal structure. Some of them are troublesome, or even dangerous, from their position and size; others, again, from their intrinsic dispositions. Some are traceable to injury, are slow in their increase, and remain loosely attached to the neighbouring parts,—from which they are cut off, and insulated, as it were, by a cyst of condensed cellular tissue. Others appear without known cause, make rapid progress, attach themselves firmly, become gradually and imperceptibly mixed with the surrounding tissues, are limited by no investment, and are endowed with a truly morbid tendency; soon contaminating all the parts around, and disposing them to assume the same action as themselves. Some remain for a long period stationary and quiet, causing little if any uneasiness; and then, from some natural or accidental cause, their circulation becomes excited; additional morbid deposite, probably of a different nature, is made; and a rapid aggravation in all respects, as regards size, feelings, and attachments, is the consequence. There can be no doubt that tumours change their characters, become softened, and assume various external and internal characters in their progress, which did not originally belong to them; that in point of fact they degenerate, and, though originally innocuous, become malignant. This is more slow of occurring in some mor-

bid structures than in others. But even the fatty and fibrinous tumours may, in the end, assume a new action, and exhibit a mixed and very questionable appearance upon a section being made of them after removal. I have seen the brain-like matter in tumours of these comparatively benign species, an obvious consequence of degeneration during many years' growth. The more simple tumours, however, may be removed, even though of large size, and at an advanced period, with a very fair prospect of permanent cure, and with every probability of the patient enjoying immunity from any disease of the same kind recurring either in its original site, or in any of the internal organs. Others, again, arising, as it were, spontaneously, increase and undergo changes rapidly, and can be interfered with only at a very early period, when the constitution does not seem to be affected, when the local disease is still limited and loosely attached, and when there is a certainty of being able to remove, not only the morbid structure itself, but some of the unaltered tissues which invest it. It would be out of place here to dilate on the pathology of tumours, or on their mode of production. The enlargements and new formations, the various solid and encysted tumours, will be noticed as they arise in different regions and situations, and the mode of treatment adapted to each considered.

TUMOURS OF THE SCALP.

The neck, the region of the head and face, and the cavities connected therewith, form a prolific field of growth to such diseases, and furnish nearly as much scope for surgical practice as all the rest of the animal machine. The cutaneous follicles become enlarged, in consequence of obstruction of their orifices and accumulation of their contents, and often form tumours of considerable size. These occur on the scalp, sometimes in considerable numbers, and prove inconvenient by their position; they may cause deformity, and are often the source of uneasy and painful feelings of tightness in the parts around. The cysts are but slightly organised, thick and white, often formed of concentric layers, sometimes tough, but in general easily lacerable. Usually their adhesions to the surrounding parts are very deli-

cate and readily separated; sometimes their attachments become more condensed, and firmly adherent to both the skin and subjacent parts, as after they have been exposed to pressure and friction. The contents are sebaceous, or curdy, sometimes mixed with a fluid of a brownish colour, and exhaling a highly disagreeable odour. These tumours are not made to disappear under any general treatment, nor can they be benefited by local applications; on the contrary, owing to the excitement and confirmation of their attachments so produced, their removal will be rendered a matter of some difficulty. No dissection is required for their removal, unless indeed they have obtained an enormous size, and, from long residence and other causes, adhere firmly. In general, when the swelling is about the size of a filbert compressed, or even of a chestnut, it can be taken out, and lifted, as it were, by the forceps from its bed of fine cellular tissue, after merely dividing the superimposed scalp. The least painful and most expeditious mode is to transfix the tumour with a narrow-bladed knife in the direction of the fibres, with the back of the instrument directed towards the cranium, and thus to divide at once the cyst and skin by cutting outwards, a little of the hair having been previously clipped off the swelling. The edges of the incision are then slightly separated with the forefinger and thumb of the left hand, and, by a pair of dissecting forceps well made, the cyst is seized and extracted. The few drops of blood that escape are wiped up, and no dressing whatever need be applied; some five or six tumours may thus be removed, at one sitting, without much pain to the patient. Sometimes a small clot fills the cavity, and may require to be squeezed out a few days after the operation. When the tumour is very small, a slightly curved sharp-pointed knife, the edge on the concave aspect, will be found the most suitable for incision. Unless the tumour has attained an enormous size, and has adhered firmly, no portion of skin should be removed. Solid tumours of the scalp,—condensed, fatty, or fibrous,—are occasionally met with betwixt the layers covering the cranial bones; they often adhere firmly, and give some trouble in their removal, which will be much facilitated by free external incision in the proper direction. Portions of the scalp are also, though rarely,

involved in malignant ulceration; so long as this is limited, and the lymphatics show no sign of contamination, the affected parts may be removed. This may be done freely, by including the disease in circular or elliptical incisions, made wide of all induration; and it may often be prudent even to uncover the bone to some extent; the question as to whether the outer lamina will exfoliate in consequence, will soon be determined by the colour of the exposed bone. When there is a loss of substance, no attempt should be made to pull or retain the parts together; we must avoid all exciting causes of inflammation of the scalp, and it will always be prudent to observe well the state of the digestive organs and skin, before and after such operations, correcting as far as possible any derangement of their functions. Encysted tumours about the forehead and eyebrows are seldom permitted to attain any large size, but their adhesions are generally firm, and prove troublesome; dissection is sometimes required in their removal. The difficulty will be much obviated by making the first incision sufficiently free. The cyst is thus fully exposed, and may be removed unopened. These tumours contain curdy or sebaceous matter, with hairs; these are either loose, or seen springing from the inner surface of the bag. The extirpation of such tumours must be clean and perfect, otherwise the secretion is continued, and, as a consequence, there is reproduction of the disease; or a fistulous opening continues to furnish thin gleety discharge, and is got rid of only by incision and removal of the remnant of the secreting surface.

TUMOURS OF THE EYELIDS.

Solid and encysted tumours frequently form about the eyelids; the former generally grow from the conjunctival surface; the latter are situated betwixt the two layers, and are often seen to be developed in the substance of the cartilage. The solid tumour may be fully exposed by everting the eyelid; it is then seized with a fine hook, or forceps, and dissected off, along with the portion of mucous membrane from which it proceeds. Some care will be required in removing such tumours growing from the inner corner, (encanthis,) when they have attained considerable size, in order to avoid interference with any part of the

apparatus for conveying away the secretions of the part. The cysts in the eyelids generally contain a glairy fluid, are thin and very adherent, attain a considerable size as regards the part in which they are situated, and occasion deformity and inconvenience; the skin is projected and often discoloured; sometimes more than one tumour exists in the same eyelid. They occur both in the lower and upper lid, but perhaps most frequently in the latter. There is no possibility of dissecting out the cyst entire; and, in attempts to do so, perforation has been made through both skin and conjunctiva, without the object having been accomplished. The correct and effectual procedure is, after everting the eyelid by a dexterous application of the fingers, without the aid of a probe or other instrument, and thus exposing a little projection within, to open this freely with the point of a fine knife; a crucial incision may be made, if the cyst be large; the contents escape, and the bleeding is allowed to cease. The cavity is then completely cleared, and the sac disturbed and lacerated by turning about the sharp-pointed probe in its cavity. If a thorough and radical cure is desired, it will be advisable to take more effectual means for the obliteration of the cavity, and for this purpose a small-pointed piece of the potassa fusa may be introduced into it for an instant. But this must be done with great caution, the melting caustic being washed away with a bit of lint dipped in vinegar and water, and the bulb of the eye afterwards protected for a short time by the interposition of a small slip of lint, or old linen, smeared with oil, or some mild liniment or ointment. The safest and best mode of applying the caustic is with a very small hollow ball-probe.

TUMOURS OF THE ORBIT.

Tumours of the orbit are occasionally encountered, and, unless at a very early period, the majority of them are irremediable by either the science or art of surgery. Some form in the cellular and fatty matter behind the bulb, which they cause to project; so long as they are confined in the parietes of the cavity, by the fibrous web in front, they cause great uneasiness, more especially when their growth is rapid. The vision is soon impaired

or destroyed, and the organ is often involved in diseased action and structure. The majority of these tumours, whether in young or old subjects—and perhaps in the former they are most common—are soft and brain-like; their increase is rapid, and in a very short period they involve and contaminate not only the whole contents of the orbit, but also the important parts in the immediate neighbourhood. The same may be said of almost all the tumours which commence in the globe of the eye. These are often seen at an early stage, when vision is not altogether lost, when the pupil is merely dilated, and opacity is perceived in the bottom of the chamber of the vitreous humour, before sensible enlargement or protrusion of the eye has occurred. The morbid structure is not slow in filling the entire cavity of the sclerotic, but it also speedily disfigures the eye, projecting through an ulcerated opening in the cornea, in the shape of a fungus, sometimes dark in colour, and furnishing blood profusely from its surface. The tumour is originally encephaloid, and in its progress assumes the hæmatoid character; or even in its earlier stages it may be broken down and mixed with masses of blood. The optic nerve is affected almost from the first, and its degeneration may be traced back into the cavity of the cranium. Accordingly, there is little chance of benefiting the patient by removing the contents of the orbit, even before they have begun to project from their situation. But some few of the tumours behind the bulb are of a more simple and benign character, and may be successfully extirpated without in any way injuring the organ of vision. These generally lie on the superior aspect, under the orbital plate of the frontal bone, but unconnected with the lachrymal gland; their existence is suspected from the slow protrusion of the eye-ball, and the gradual loss of vision. The swelling may be felt firm and resisting, by pressing the finger betwixt the eye and the roof of the vault. By careful incision and dissection such tumours of considerable size have been removed, the functions and position of the eye have been restored, and the patient has enjoyed an immunity from disease. There is one specimen of large size, in my collection, which was so obtained; the operation was performed many years ago, with a result as satisfactory as the cure proved permanent.

The protrusion caused by acute or chronic abscess in the orbit, or by accumulation there of bloody serum and broken-down coagula after bruise, must not be mistaken for that caused by tumour. The history of the case, the more diffuse swelling, and the œdema of the lids, will lead to a correct diagnosis and line of practice. A deep puncture will verify the opinion formed; and when the existence of matter is expected, the evacuation of it thus should not be long delayed; of course puncture should not be made into bloody effusions.

Tumour of the eye itself is sometimes limited by its proper coats; and though not of the most harmless character, may yet be removed with a fair prospect of successful issue. Melanotic degeneration of the eye-ball is met with, but not so often as is supposed, in this situation, chronic dropsy of the eye with thinning of the sclerotic and dark projections of the surface being occasionally set down as melanosis by careless observers. Melanotic tumours have been extirpated successfully. The fluid swelling does not demand so severe a proceeding; repeated puncture, or a puncture in a favorable situation opened at short intervals with a conical and blunt-pointed instrument, so as to permit the gradual draining away of the contents, will often be followed by complete and permanent collapse of the tunics; the part then becomes quiet, and the deformity can be covered by an artificial eye.

When it is judged prudent to remove the whole contents of the orbit, means must be taken to seize and fix the eye; for this purpose it is recommended to pass ligatures through and across the organ, or to transfix it with tenacula; but the forceps with hooked extremities, or vulsellum, represented p. 301, will be found the most convenient instrument. The commissure of the eyelids at the outer angle is divided, so as to give more room; and then with a narrow sharp-pointed knife, the different attachments are separated all around, and to the bottom of the cavity. No crooked instruments are wanted either to divide the nerve, or clear the orbit of all its contents. The bleeding is readily suppressed by emptying the cavity thoroughly of blood,—or clot, if it has formed,—filling it with dossils of dry lint, to above the surface of its margins, and retaining the whole by a double-

headed roller firmly applied: at the end of two days this may be removed; in fact, the bandage may be slackened after ten or twelve hours. After removal of the compresses, the cavity is dressed lighty with lint soaked in tepid water, the surface being covered with oiled silk, and after a time an astringent lotion may be cautiously added.

TUMOURS OF THE FACE.

The side of the face is the seat of subcutaneous tumours, either encysted or solid, of various sizes, and variously connected. It is seldom that tumours in this region are permitted to attain a large size, unless they are deeply situated and firmly connected. The loose tumours of small size can readily be got rid of by free incision over them in the right direction, dissecting down to the cellular investment, and dividing this, avoiding the parts with which they may be in contact,—the vessels as far as possible, the branches of nerves, the cartilage of the nose, the membrane of the mouth, the lachrymal passages, and the parotid duct, according to their position; the cellular attachments are then separated, and the diseased part taken away. It will be advisable not to remove any portion of integument, unless it is firmly attached to, and incorporated with, the morbid mass, or otherwise involved in diseased action. The incisions must be so placed and contrived, that their edges may come together smoothly and neatly. In many cases, in order to secure a smooth and linear cicatrix, the twisted suture must be employed.

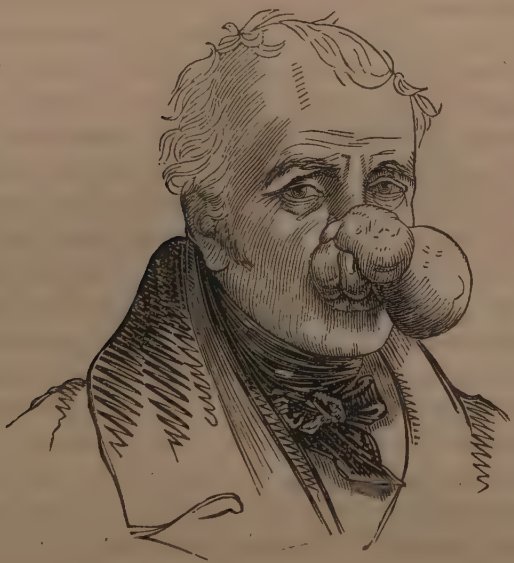
The integument of the face is often involved in disease, commencing very generally in a warty excresence which becomes ulcerated, and not confined in its ravages by any structure; such affections are seen in the advanced stages destroying the integument, and subsequently involving the other tissues,—muscles, cartilages, bones, and the organs of the senses; various terms are applied indiscriminately to the ulcers, as,—lupus, noli me tangere, herpes exedens, and cancer. Many of these very formidable ulcers, though difficult to manage, are not malignant; their progress may often be arrested, and they may be made to heal over in whole or in part. With this view the everted, prominent, and hardened edges are to be destroyed by

the application of some powerful escharotic; the chloride of antimony in its concentrated state, or the chloride of zinc made into a paste with flour, is applied, and repeated on various parts, according to circumstances; the potass and nitric acid cannot be sufficiently limited in their action. These applications are much to be preferred to the corrosive sublimate and the arsenical powders or pastes; the effects upon the system from such are often most alarming, and have proved fatal. The painful feelings attendant upon the use of strong caustic are allayed, as much as possible, by the internal exhibition of the preparations of opium. Besides, constitutional and local treatment, varied according to the state of the system and aspect of the sore, must not be neglected; and in this way very frightful swellings and ulcers, considered malignant and incurable, have been much benefited.

Lipomatous enlargements of the integument covering the cartilage of the apex and alæ of the nose, though sometimes presenting a very formidable appearance, are in general very easily managed. Their nature must be well understood; and the operation must be conducted on a proper plan, so as to preserve the essential parts which give form to the organ. The disease is limited to the skin and subjacent cellular substance; the tissues are opened out and somewhat thickened; the sebaceous crypts are enlarged and distended with their secretion, some of them to a considerable degree, forming encysted tumours of the size of a garden pea: the cellular tissue is loaded with serosity, and in some places there is evidently fibrinous deposite; the arterial capillaries are not much enlarged, though the veins on the surface sometimes are, giving to the tumour a blue and distended appearance,—as when the part is dependent, or its circulation excited, or the return of blood prevented by violent exertion of the lungs; different parts become affected in succession, and the mass is made up of many growths from the point and sides, of various sizes, separated by fissures in which the sebaceous secretion lodges, often rancid and offensive. These swellings, though attached by broad bases, are loose and pendulous; they do not certainly improve the personal appearance, and prove very inconvenient and troublesome by interfering with

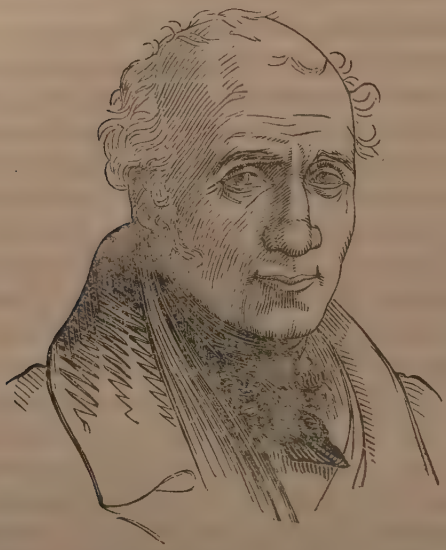
the functions of the nose, obstructing the passage of air, covering the mouth when they attain a large size, and preventing the patient from taking his food or drink comfortably.

These tumours are very insensible, and may be squeezed and pulled about without causing pain; their growth is very slow



and gradual, and is not attended with any suffering. The patient from whom the above sketch was taken, had perceived the rudiments of the enlargement fifteen years before he applied for relief. The operation was at his request performed at two sittings, with eight days interval, and in five or six weeks he presented this improved appearance. (*See p.* 284.)

A dread of troublesome and dangerous hæmorrhage seems to have restrained surgeons generally from interfering with these cases, although many patients must have been willing to submit to any suffering, in order to be relieved from the shocking deformity and serious annoyance. Mr. Hey, of Leeds, and Mr. Barlow, of Blackburn, have each published a successful case; and two very good ones are related by M. Civadier, in the third volume of the "Mémoires de l'Académie de Chirurgie," as ope-



rated upon by him and M. Theulot so early as the years 1732 and 1753. The disease is there described as carcinomatous. It has been stated to me, on the best authority, that my late worthy friend Sir W. Blizard, under whom I had the honour of studying at the Old London Hospital, on one occasion operated upon the hypertrophied nose of a man whom he had admitted for the cure of an ulcerated leg. (Is it not possible that Sir W. mistook the nature of the tumour, and tried to pare off a vascular erectile swelling?) He thought that whilst the man was necessarily under treatment for this latter malady, he might as well be relieved of his deformity. Incontrollable bleeding occurred, and continued to such an extent as to free the patient from all his earthly troubles and sorrows within twenty-four hours. A misapprehension of the true nature of the disease, and the effect of such a case as this occurring in the hands of a man high in the profession, may have naturally enough rendered surgeons unwilling to recommend or undertake, even at the request of patients, any operation for the improvement of their appearance, "an operation of complaisance," as it has been termed.

Portions of the morbid mass have been removed by ligature, but with no very satisfactory result. The cartilages of the alæ evidently suffered, in one case in which this was attempted; in fact, it is impossible by this means to remove with precision the diseased part only, leaving the true form of the organ unimpaired. Besides, the fetor attendant upon the separation of the mortified part, in this situation, must be extremely disgusting and intolerable to the patient.

The morbid growth may be dissected off without the least risk from hæmorrhage; and by the observance of due care, and a little neatness, the form of the organ can be most perfectly preserved. An incision should be made through the diseased integument and cellular tissue in the mesial line, upon the cartilages of the apex and columna,—not, however, so as to injure them; an assistant places his fore-finger in one nostril, and the surgeon, seizing the mass either in his fingers, or with a small vulsellum, proceeds to dissect it off with a scalpel; the incisions must be carried close to the cartilages of the ala, until the one side is cleared,—the edge of the opening being well observed, and not encroached upon. The assistant will give warning if the knife, at any stage of the proceeding, approaches his finger. The surface is trimmed a little, if occasion requires, with a pair of thin, slightly curved, or knife-edged scissors. A similar proceeding is observed on the opposite side, so as to make the part as symmetrical as possible. A few vessels may bleed, but the flow is easily restrained during the dissection, by placing the small spring forceps (Graefe's) upon their mouths, or compressing them by the point of the finger; ligatures are afterwards applied, if they still persist in bleeding. Should the ligatures not hold, the cut ends of the vessels not being readily drawn out from the condensed tissue, a fine cambric needle may be passed across the bleeding point, and a ligature tied under it, the ends of both the needle and the thread being afterwards cut off. Any troublesome general oozing may be stopped by plugging the anterior nares, applying a compress of lint outside, and retaining it by a double-headed roller. Difficulty and pain, however, are experienced in removing this dressing, and it is much better, if possible, to apply, frequently and assiduously

for a few hours, pledgets of lint moistened with cold water; and, after coloured discharge has ceased, to substitute the tepid dressing, and thus encourage suppuration. The exposed surface in this situation soon becomes clean, and presents small, pointed, and florid granulations; after a time the zinc or other lotions, well diluted, are employed with advantage. Cicatrization very soon takes place, and the surface, at first glazed and discoloured, soon assumes a perfectly natural appearance. I have thus removed the diseased parts in a great many cases, without one untoward accident. In but one case have I had occasion to repeat the operation, and that at an interval of nine or ten years. A tumour of large size was in the first instance removed from the apex: at that period there was but slight thickening of the integuments of the alæ, and it was not thought necessary to interfere with them. But the thickening afterwards increased so as to form a large swelling on each side of the apex, which remained smooth and very sound. These secondary lateral growths were taken away, much to the satisfaction of the patient, who was no longer subject to the annoyance of being stared at in the street, or, as he writes, run after by little children as "they went to fetch mustard."

POLYPUS OF THE NASAL FOSSÆ.

The tumours which occupy the interior of the nostrils are also, most happily, of a simple and benign nature in the majority of cases. They seldom occur singly, and usually occupy both nostrils, to a greater or less extent; they hang in clusters by pedicles, from the membrane lining the superior turbinated bones, present a smooth surface, and are by no means very sensible; they are semi-transparent, and gelatinous-looking when removed, with small blood-vessels ramifying through them. Such mucous polypi sometimes exist for years without attaining any great size, or particularly attracting the attention of the patient; and they do not seem to degenerate. I have met with cases in which they had existed for ten, fifteen, or twenty years, causing latterly much annoyance; and yet they have been, at a few sittings, eradicated successfully and permanently. A professional friend sent to me lately, in great alarm, about a

troublesome hæmorrhage from the nostril. In blowing his nose forcibly some hours previously, he had ejected a tumour of large size, of the existence of which he had not been previously aware. Its bulk was fully as great as the first joint of the thumb, and it must have existed for a long period. On careful examination afterwards with the speculum, others of a similar size could be seen in each nostril. But in general these tumours cause inconvenience, by occupying the fissure betwixt the anterior and posterior cavities of the nostril. They obstruct the free passage of air, and give the patient the feeling of constantly labouring under a cold in the head. The mucous secretion is much more abundant than is natural; the sense of smell is destroyed, and the taste becomes less perfect and discriminating. The hearing, even, is obstructed in the advanced stages of this disease; the nostrils are expanded, and the bones become separated, so as to alter the appearance of the countenance; the eyes appear watery and distended, and when the atmosphere is charged with moisture, the growth sometimes project externally, filling up the meatus and resting on the lip. These tumours, instead of containing a serosity in cells, occasionally consist of one serous cyst, more or less thick, covered externally by adventitious mucous tissue. The soft mucous polypus seldom occupies the posterior cavity of the nostril to any great extent; it may hang into it, as it does into the anterior space, but it is not common to find it appearing in the throat behind the velum. Such cases, however, do present occasionally, and the annexed plan will give a very correct idea of this state of matters, in a young lady on whom I operated successfully a few weeks ago. After completely clearing the anterior cavity and fissure by removal of the tumours hanging in that situation, the passage of air was still as much obstructed as ever. The velum having been observed to bulge forwards, the throat was again examined, and, by lifting the margin of the fold, the

body of a tumour could be brought into view. The patient stated that she had been able occasionally to see it during inspiration, in damp weather. The nature of the tumour was apparent enough, and it was tolerably certain that its attachment was by a narrow base. The forceps having been carried deep into the cavity of the nostril, the neck of the polypus was laid hold of and twisted off; the doule-headed tumour, which then dropped considerably, was seized by a small vulsellum in the throat, and so extracted without difficulty.

Care must be taken not to mistake, for polypus, turgescence of the Schneiderian membrane upon the inferior spongy bone, or projection of the cartilaginous septum into the left nostril, which is very common, and may be attended with chronic congestion and swelling of the membrane lining the whole cavity, and by continued discharge and stuffing of the passage. But such errors are occasionally committed, and acted on, to the prejudice of the patient. The mucous polypus can be removed, thoroughly and effectually, only by the determined yet judicious and gentle employment of forceps suited to the size of the cavity. Those made for sale by cutlers, are more like farriers' tools than surgeons' instruments. The instrument must be slender yet strong, and well fitted at the extremities; a pair of spring artery forceps, or small vulsellum, will sometimes be found useful in fixing and pulling forward the larger growths, so that they may be seized at the neck. One is laid hold of after another, and, by a turn of the hand, detached and extracted; they are twisted off, not pulled. No violence is advisable, no crushing and tearing of the turbinated bones. The delicate nature of their structure, and the vicinity of the base of the brain, must be kept in view, besides the cruelty and uselessness of removing healthy structure in such cases. Some not very adroit people seem to find it an easier matter to bring away the spongy bones and their coverings, than the polypus growths, and even go so far as to attempt convincing their patients that the eradication is otherwise incomplete.

It is impossible to promise a cure from one operation, and of this the patient must be previously made sensible. There is always some slight flow of blood attendant upon the twisting

out of polypi, and, after a few have been removed, the view of the surgeon is obscured. In cases of old standing, when the cavities and fissures are much dilated, the introduction of the little finger, which can then be readily passed to its full extent backwards, will convey information as to the existence and site of those which remain, and will serve to guide the forceps safely. The nostril should be cleared at the first sitting, so that the patient can breathe freely through it; and after the parts have recovered and the tenderness has abated,—that is to say, at the end of six or eight days,—the cavity is again examined. The nostril will probably be found again closed, with tumours presenting in it as if nothing had been done to eradicate them. The polypi, formerly confined in the narrow spaces and anfractuosities, expand and fall forward, occupying the site of those which have been extracted. In examining the nostrils in recent and doubtful cases, and in order to be certain that nothing remains, at the latter sittings great assistance will be derived from the speculum which I have used for some years, and which is now to be had of the principal instrument-makers. In the explorations and operations, the patient should be placed in a good light, the head being thrown back, and supported either on a high-backed chair or by an assistant; and the blood is best prevented from running down the neck and soaking the clothes, in this and other operations on the face and cavities opening upon it, by the old-fashioned basin of the barber-surgeons. Should bleeding persist after these operations, it can in general be readily stayed by pushing, with the forceps or director, a long piece of lint into the posterior cavity of the nostril, and stuffing both that and the anterior cavity as well as possible. In all cases, it is right to place a bit of lint lightly in the cavity, and retain it a few hours, or at least until the patient has got comfortably seated at home.

If bleeding be not arrested by the methodical introduction of lint from the anterior opening of the nasal fossa, it may be necessary to close also the posterior cavity effectually. This is easily done by the introduction of a ligature from the mouth forwards into the nostril: a loop of silver or other wire will answer as well as any of the complicated instruments sold for the

purpose of conveying the ligature. This is passed along the floor of the nostril from before backwards; it is seen in the pharynx, and having been laid hold of by the fingers, or blunt hook, or forceps, is brought forward; and to this is attached a strong thread ligature, which is drawn into the passage by the removal of the wire. To the middle of this latter ligature, a piece of lint is attached in a noose, the bulk of the lint being proportioned to the size and sex of the patient. It is conducted by the finger behind the velum, and pulled firmly into the cavity. The anterior opening is then plugged with lint also. In a day or two, after washing out the coagula, the dossil is easily removed by pulling at the string, and assisting in its dislodgement by the introduction of a strong blunt probe. It is seldom necessary to adopt this proceeding after operations for polypus; but it may be, and is occasionally, required for the arrestment of spontaneous epistaxis, after all other means, local and general, have failed.

In some rare instances, a tumour of a different character is found to occupy the posterior cavity of the nostril. It is of firmer consistence than that above noticed, fibrous, or lamellated in texture, covered by mucous membrane, and attached more firmly and by a broader base. As this growth increases in size, it causes many uneasy feelings, and ultimately interferes with articulation and deglutition. Its removal can be effected safely only by ligature. A loop of wire or catgut can be passed into the fauces as already directed, and this, expanded on the middle and fore fingers, may, by an effort, be passed over the body of the tumour, and drawn up to its neck. The confined situation, the struggling of the patient for breath, and his efforts to vomit, occasion difficulties, but these can be overcome by determined and dexterous management.

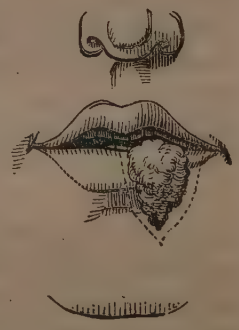
The wire or catgut ligatures, however, cannot be depended on; they are apt to give way after a day or two, if much resistance has been offered to their being tightened, as when the neck of the tumour is thick or very dense. A ligature of fine yet strong whipcord can easily be carried round the base of the tumour, either by the finger, or by means of the loop of wire. This ligature is not so apt to give way; it is tightened from

time to time, and drawn through a piece of metal tube in the nostril—as a bit of silver catheter,—and fixed to the eyes; or it is tightened and secured by an iron stalk, with rings at each end. Tumours of a malignant character, proceeding from one or other of the sinuses which open into the nasal fossæ, are sometimes found occupying these passages completely. They are of the nature of medullary fungus, and sometimes present the character of fungus hæmatodes. Such growths, when they present in the nostrils, are perfectly irremediable, and incontrollable by any surgical proceeding. If such tumours are ever interfered with, in order to give relief to the patient, by diminishing the obstacles to his breathing or swallowing, there is a risk of considerable loss of blood, and a certainty of very rapid reproduction.

DISEASES OF THE LIPS.

The lips are occasionally the seat of small encysted tumours, lying under the prolabium, and containing a thin, glairy, straw-coloured fluid; the bag is thin, and firmly adherent. A free opening, and the turn of a pointed bit of the lapis infernalis in the cavity, after the discharge has ceased, will ensure a permanent cure. Solid tumours also form in this situation, and are generally at some period attended with ulceration; this may, however, be a cause of induration and tumour, as well as a consequence. Malignant ulcerations are always attended with a degree of swelling and hardness about their base; they may first appear on the surface in the form of abrasion from external causes, or they may follow a warty excrescence. In some cases, the enlargement of the part is considerable before the surface becomes broken. Many ulcers of the lips may be encouraged to heal rapidly and permanently, by removal of the exciting cause, the application of proper dressings, and repose of the part. Some obstinate sores may with propriety be treated with escharotics. The paste composed of equal parts of the chloride of zinc and flour, about which so much has been lately written and said, will be found to answer well; it does not spread, and is very manageable; but as to its superior power in concentrating the virus, or destroying the disposition to malig-

nant disease in the surrounding parts any more than other caustics, that is all idle talk and conjecture. Operations upon the lower lip and angle of the mouth are frequently required for the removal of malignant disease, in the form of warty excrescence, or ulcer with induration,—commencing in and involving the prolabium, the mucous membrane of the lip, the mucous follicles, or surrounding cellular tissue. The character of the broken surface, and of the indurated base, cannot be mistaken. If advantage is to accrue from the extirpation, it must be undertaken at an early stage, before the lymphatics have become contaminated, certainly before they have shown any irritability or swelling; and it must be effected thoroughly, the incisions being made very wide of the morbid structure. This must be the first object; and in many cases it can be accomplished so as to leave little trace or deformity. Previous to the operation, the mouth must be put into a comfortable state; any bad teeth or tartar must be removed, more especially from the centre of the lower jaw; the state of the gums must be looked to; and the patient must afterwards abstain from the application or use of any exciting cause, as smoking a short pipe or cigar. When the disease is limited to a small portion of the prolabium, and the cheeks are loose and extensible, as in old persons who have lost many of their molares, it may be included in a V incision, the two limbs being of equal extent, so that they may come smoothly together. This is done, with least pain to the patient, by transfixion at the apex of the part to be removed, the lip being stretched by the fingers of the surgeon and an assistant. The knife is directed towards the surgeon so as to divide the parts through the free margin of the lip. He then seizes the part to be removed, and makes the second limb of the incision, either by laying the blade of the knife upon the prolabium and cutting towards the apex, or by again transfixing close to the original entrance of the bistoury and cutting upwards; the slight remaining attachment is imme-



diately separated. The incisions are thus made much more smoothly and quickly than by the use of the scissors or scalpel, though aided by any sort of forceps, crooked or straight. The edges are put together by the twisted suture, as will be explained and delineated in the fifteenth Chapter.

But the greater part of the free surface of the lip may be implicated; and in such circumstances, any attempt to bring the divided edges into contact would be almost certain to fail, and, if successful, would be attended with great deformity and inconvenience from the almost total closure of the mouth. The diseased part must nevertheless be removed wide of the hardness. This is easily effected; the parts having been put upon the stretch, the bistoury, passed through the lip, is first directed to one angle of the mouth, and then to the other; after any bleeding vessels have been secured, a point of suture may be passed through the skin and prolabium, and the water-dressing applied. At first, the saliva is not well retained, but it is satisfactory to see how much the lip is elongated after a time; and when the cicatrization is completed, very slight deformity remains. The fact is, a good deal of the base of the sore is adventitious, and has displaced the healthy structure. When more than one half of the free surface of the lip must of necessity be taken away, it is always right to follow this latter mode of proceeding.

The greater number of these cases are cured when the operation is adopted before the lymphatic glands in the neighbourhood become affected; but in some cases, as in the one from which the accompanying sketch was taken, even without any enlargement of the glands, the seeds of the disease appear to lie dormant in these parts, and though the cicatrix of the original wound remains perfectly healthy, the soft parts underneath the jaw become affected, the bone is involved secondarily, and the patient dies a victim to a most horrid malignant tumour. To such tumours no operation, or no escharotic external application, can be of the least avail. The following case is illustrative of the subject.

Jas. S. æt. 44, admitted into the North London Hospital, March 26, 1840, under Mr. Liston. Three years ago he per-

ceived some ulceration and hardness of the left side of the mouth, which he attributed to smoking a short tobacco-pipe. The ulceration continued for two years; he then had a portion of the lip removed; the glands under the jaw were not enlarged at this time. A month after the operation he perceived some swelling under the centre of the jaw, which has continued to increase up to the present time. On admission, there is a large tumour situated under the centre of the chin, firm, hard, somewhat elastic towards the apex, where it is ulcerated. The ulcerated part bleeds occasionally when touched. The tumour is firmly adherent to the maxilla, and the bone seems somewhat enlarged. The skin over it is discoloured, reddened, and firmly adherent: it is painful at all times, but more especially at night, and is very painful when handled. He was ordered some pills with conium and narcotics, and discharged as incurable.

I have seen part of the jaw removed together with the tumour, in cases similar in all respects to the one just described. It is a most cruel and unjustifiable proceeding, and one which can only cause pain and suffering to the patient, without in any way furthering the cure of the disease.

TUMOURS OF THE MOUTH AND FAUCES.

The loose cellular tissue under the tongue often contains fluid collections, and is occasionally also the seat of solid tumours. Some of the former are connected with the salivary ducts, and arise from obstruction of their orifices and consequent dilatation. In slight cases, the orifice may be easily cleared and enlarged by the introduction of a small blunt probe; the obstruction may arise from the accumulation of earthy matter, which is often deposited so as to form a considerable concretion,—a salivary calculus, as it is called. There is no difficulty in either detecting or removing this foreign body. Encysted tumours, unconnected with the salivary ducts, are frequent, and often attain an inconvenient size, so as to interfere with the free motions of the tongue, and render speech indistinct. Their cysts are generally thin and very adherent; they are, besides, extensive, passing amongst the muscles, deep under the tongue. The contents are usually thin and glairy; sometimes the cyst is thick, coated with hairs, and the contents atheromatous. It is vain to think of dissecting out the secreting membrane when thin, either entire or piecemeal. The introduction of a seton is attended, as I know from experience, with serious inflammatory infiltration into the loose tissue around. I have, in preference, been long in the habit of opening the cysts extensively, and destroying them by the free application of potass; no dressing is required, but the patient may, for a few days, use some detergent lotion. The result is most satisfactory, for, out of a great many cases, I have known no return of the disease. Fluid collections in this part, more especially if connected with the salivary ducts and glands, when neglected often attain a large size, and cause tumour under the chin. An unhealthy abscess may result, demanding a free and dependent incision from without; the discharge is at first thin and flaky, consisting of saliva and vitiated mucus; it ultimately becomes purulent, and the swelling gradually abates.

Solid tumours, generally of fatty consistence, are sometimes found in this situation, causing the same indistinctness of articulation as the ranulæ—so the fluid tumours are termed—and

presenting to an inexperienced observer the same characters,—the bulging of the membrane into the mouth, the displacement of the tongue, and the swelling under the chin when the tumour has attained considerable bulk. These solid growths are benign, loosely connected, and demand interference merely on account of their inconvenient size and position. I have removed some of large size from this region, by freely dividing the membrane of the mouth, and with the fingers, detaching the tumour from its fine cellular bed. It requires some little tact to distinguish betwixt the fluid and solid tumours in this situation; and even in other and more exposed regions, where there is no difficulty presented to free manipulation, those composed of solid matter are not unfrequently supposed to contain fluid of some sort, and *vice versa*. This often enough occurs from overlooking the history of the case, and from confounding the feeling of softness and elasticity with that of fluctuation.

The tongue itself is affected by swellings of various kinds. It is subject to simple engorgement and enlargement, with more or less hardness; and this may result from inflammatory action induced by injury, or long-continued irritation, or it may arise from derangement of the general health. This hypertrophy,—*lingua propendula*,—increases rapidly after the organ projects, in consequence of difficult return of blood, caused by its unfavorable position, and constriction of the jaws and orifice of the mouth, producing pressure upon it. The nature of this affection is treated of very correctly, though at the same time concisely, (a very great recommendation,) by Lassus, in his Pathologie Chirurgicale, tome ii., and the remedy clearly indicated, viz., support of the organ by a sling, and gradual replacement into its natural situation. An interesting case of the kind occurred lately in a young subject, under the care of Mr. Cross at the Norfolk and Norwich Hospital: I saw the case, and he has kindly furnished me with the particulars. In some similar cases, a portion of the organ has been removed by a shaped incision, and the cure much accelerated, the edges being put together by a point or two of suture, after the oozing had ceased.

Recourse to this operation, however, cannot be often necessary. Adventitious growths of fibrous or other structure sometimes proceed from the organ or parts of it, and occasionally become affected by malignant induration and ulceration; the tongue has also, though rarely, been found affected by erectile tumour. Many of the more simple enlargements may be got rid of by removal and abstinence from exciting causes, by due attention to, and correction of, the general health, and by frequent local abstraction of blood. It is absolutely necessary, in some cases, to remove the diseased and altered parts, by operation. When these are favorably situated, and not extensive, the vulsellum and knife may be employed, there being no great difficulty in holding the organ so as to secure any vessel, or otherwise arresting the flow of blood. When a large portion of the tongue is involved, recourse must be had to ligatures; these are passed wide of the disease, by means of needles fixed in handles, the perforations for the thread being close to their point. Two or more double ligatures are introduced, and by these, stronger ones are drawn through and tied so as to strangulate the whole base; with the view of saving pain and abridging the process as much as possible, they should be drawn with extreme tightness; in some cases, by previous incision to some extent, they may be allowed to take a deeper hold, so that the pain shall be lessened, and the period of cure much abridged. The salivation is most profuse, and the discharge and effluvia very offensive; some lotion may be prescribed to correct this as much as possible, and, after the separation of the dead part, the healing of the breach of surface is to be promoted by all possible means. Tumours situated on the posterior part of the tongue, and projecting from it, may be thus removed; care being taken, in introducing the needles, to guard with the finger the epiglottis, or other important parts. After one ligature has been introduced, the organ is completely under command.

[The application of ligatures for the removal of great enlargements of the tongue, as here recommended, gives rise to exquisite suffering, and cannot, in all cases, be made to interrupt permanently the circulation in the part. Within a few years past, two remarkable examples of simple hypertrophy of the

tongue have come under the care of Dr. Thomas Harris of this city, in both of which the knife was successfully employed.

One of these occurred in the person of an Irish girl, æt. 24, in whom the disease commenced at four years old, and had continued up to the time of her applying for relief, uninterruptedly increasing. At the period of operation, the length of protrusion from the upper incisors to the most depending part of the organ was four inches; around its edge from the canine teeth on either side, seven inches and one fourth; circumference, six inches and three fourths; vertical thickness, one inch and three fourths. The prolapsed portion of the tongue was dense and dark coloured. The part within the mouth, was entirely free from disease, was natural in width and appearance, with the exception of an enlargement of the papillæ maximæ. Troublesome hemorrhage being apprehended, it was determined to remove it by means of a ligature. For this purpose a long needle, armed with a double iron wire, was passed through the tongue at a point corresponding with the anterior edge of the inferior maxilla, and brought out opposite the superior incisor teeth. The ends of the wires were then separated, and passed through double canulas on either side of the tongue, and drawn very tightly until the prolapsed organ appeared perfectly strangulated. Great force was used in the application of the wire, yet two hours after the operation the circulation was found not to be entirely interrupted. A strong silken ligature was then passed around the tongue so tightly, as again apparently to strangulate it, but after the lapse of forty-eight hours it was discovered that the circulation was again fully restored, even to the apex of the tongue. Further efforts at strangulation were judged injudicious, and it was amputated directly through the depression formed by the ligature. Five arteries required to be secured, but the hemorrhage was in no degree alarming.

The pain caused by the knife was trifling, when compared with the torture occasioned by the ligature, and no unpleasant symptom followed the operation.

In the second case the affection was congenital, and the patient was 19 years of age, when he applied for relief. The tongue projected three inches beyond the upper incisors, the circumference was six inches, and the vertical thickness an inch and a half. It was of a violet colour, hard, and incompressible, and the portion of it without the mouth was much larger than that within. The operation was performed by Dr. Harris, in the following manner. The tongue being elevated, and dissected from the floor of the mouth, about three quarters of an inch behind the anterior part of the jaw, a straight bistoury was pushed through the organ, between the median line and the left ranine artery, at the point where the first incision terminated, and

drawn obliquely forward, so as to form the left flap, terminating at a point corresponding with the teeth. The divided artery was taken up, and the bistoury again introduced in a corresponding position on the right side, by which the opposing flap was made; the artery was secured and the intervening space was divided by scissors. The cut in the tongue resembled in form the letter V inverted. The flaps were then approximated, and maintained in this state by means of interrupted sutures.

In this manner a pointed well-formed tongue was made, of the ordinary length. On the fourth day, the ligatures were removed, and on the fourteenth, the wound was entirely healed.

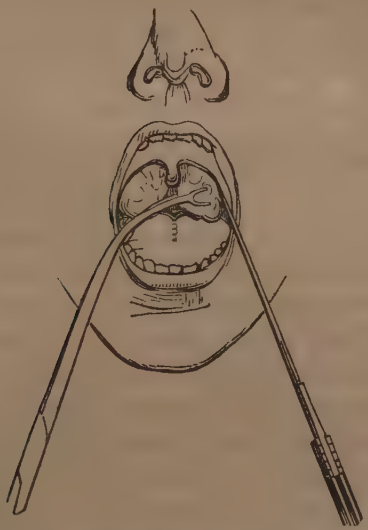
A letter received from the patient, more than a year after the operation, states, that his jaws are nearly closed—all deformity removed—that he articulates distinctly—is in excellent health and spirits, and engaged in his studies in college.—*Amer. Jour. of Med. Sciences*, vols. 7 and 20.

In a third case which came under my notice, the patient refused the operation, and the treatment recommended by Lassus, viz. return of the organ by gradual pressure, was faithfully pursued, though without benefit.]

Swellings about the velum palati prove a source of great uneasiness; they interfere with the passage of food, and also interrupt, in some degree, the free entrance of air; they alter the voice, cause noisy respiration, more especially when the patient is asleep, and may even threaten suffocation. Sudden death from enlarged tonsils has been known to happen, viscid mucus becoming entangled in the narrow fissure betwixt the swollen glands. The acute swellings are to be got rid of by antiphlogistic means; and by incision, if it is evident that fluid has been secreted betwixt the folds or in the substance of the mucous glands. The incision must be directed backwards, the head being well secured by an assistant; the danger of carrying the point of the instrument deeply to either side in the throat is well known, and there might be great risk from any sudden motion of the patient. A knife, covered by a canula into which it is retracted by a spring, (pharyngotome,) may be used for the purpose, and is useful, when operating on young subjects, in opening abscess in the mouth, throat, or pharynx; but in the majority of cases the long, narrow, sharp-pointed bistoury may be used with both safety and advantage; it may be rolled in a slip of

lint up to the point, to insure safety; it is passed along the fore-finger, which secures the tongue, with its back towards that organ, and its point directed to the soft and prominent part of the swelling; it is entered into it, and an incision of sufficient extent made upwards.

It was customary to remove the chronic enlargements of the tonsils and uvula by ligature, and, strange to say, this method is still preferred and practised by some surgeons. It is a most difficult, tedious, painful, and unsatisfactory proceeding, so far as I have seen and can understand it; there is no excuse for its continued preference, as no risk whatever of bleeding is incurred when incision is practised properly. In many cases, operation may be altogether dispensed with, by the use of strong astringent applications and constitutional treatment, and by either getting rid of the cause, or waiting until that disappears,—until, for example, wisdom teeth make their way through the gum, and this may sometimes be accelerated. But when other means have failed, and much inconvenience is felt,—above all, when the isthmus faucium is much narrowed, and any alarming difficulty of respiration has occurred,—the removal should not be delayed. It is by no means necessary to take away the whole tonsil, and the attempt would be attended with the greatest danger. The enlargement is but an opening out or simple hypertrophy of the gland; and consequently the surface heals kindly, and there is no reproduction of the tumour. Were the growth an adventitious one, the practice could not be defended, and would not answer the purpose permanently. The prominent part of the swelling may be safely removed from either one or both sides. The patient having been placed opposite a strong light, the surgeon depresses the tongue with the fore-finger of one hand, and seizes the body of the gland with the vulsellum held in the other, as here represented. He then introduces the narrow, straight, blunt-pointed knife, which he has held in readiness betwixt his lips, with its edge directed upwards under the gland; and, by a few gentle sawing motions, severs it on a level with the folds of the velum. The instruments must be held in the right or left hand, according to the side operated upon. Im-



mediate relief follows this proceeding; it is not by any means so painful as the removal of a tooth, and is not attended with greater loss of blood.

[A good instrument for excision of the tonsils has been invented by Dr. Wm. H. Fahnestock, of Lancaster. It consists of a piece of steel, rounded and polished, eight inches long, and about one fifth of an inch in thickness, with a hole passing longitudinally through its centre. One end of this is made to terminate in an oval ring that is split into two equal parts, which split extends one and a half inches down the stem, for the passage of the knife, hereafter to be described. On the stem are two projections—one close to the extremity of the oval, and the other about three inches below it; through which are small holes for the passage of the needle. The needle is four inches in length, and works through the two small holes mentioned. The knife is flat and made to fit in the split of the above named oval; the stem to which it is attached passes through the longitudinal hole in the instrument, and has the handle affixed to its end. The instrument will be readily understood by reference to the accompanying cut, which represents it one half of the proper size. The knife is partly drawn down as in cutting. In operating, the tonsil is caught in the oval opening of the instrument, where it is firmly held by pushing the needle through the base of the gland. Thus secured, the instrument is seized with the left

hand, while with the right the knife is drawn out and the part excised.]

The uvula may be abridged with safety and propriety, when affected by chronic enlargement which has resisted judicious treatment, or when altered in structure as is sometimes the case, having become hard and warty at its apex. Constant irritation about the glottis, and troublesome cough and expectoration, are thus often removed at once. A pair of long and good scissors answer the purpose best; the extremity of the body is laid hold of and put upon the stretch by a pair of long forceps with sharp points, adapted to the operations on these parts; and then at one snip it is cut across in its middle. A variety of complicated instruments have been at various times invented for the removal of tumours of those parts; they are very unnecessary and useless. Adventitious tissues are sometimes developed in this situation, lodged betwixt the layers of the soft palate, or adherent to its surface by a base more or less broad. The former may have attained a large size, and contracted firm adhesions; and this may have been accelerated and increased by improper treatment,—by partial incisions, and impotent attempts with caustics. Their connexions may be such, that extirpation cannot be attempted without great risk from hæmorrhage, and without the destruction of parts whose functions are important. Tumours of fibrous or fatty matter may sometimes be taken away by simple division of the anterior layer of the velum, with little use of the knife after their surface has been freely exposed, and with trifling loss of blood. Those on the surface can also be thoroughly removed without danger of their recurring, and without any derangement in function or structure of the parts to which they have been attached. Even large and formidable tumours may sometimes be thoroughly eradicated from this region. I was concerned in a case of this kind, some time ago,

with my friend Mr. Grainger, of the Borough, in which, though with some difficulty, he in the end succeeded in removing a large diseased mass from one side of the velum and pharynx. The patient perfectly recovered his distinctness of articulation, and obtained a most satisfactory cure of an extensive and very awkwardly situated disease. The operation was undertaken under an impression, which turned out to be well founded, that the tumour was not of a malignant nature, that it was bounded by a cellular cyst, and that it was not intimately attached either to its coverings or the important parts around.

None of the operations in the mouth or fauces can be accomplished, without the full consent of the patient throughout the entire proceeding. Accordingly, before the surgeon undertakes any operation likely to be at all tedious, or attended with difficulty, he must be confident that the patient's mind is fully made up to bear it well, and to afford every possible facility. The jaws may be prevented from closing involuntarily, by placing betwixt them a cork, or the wooden handle of any instrument; innumerable specula have been contrived for separating the jaws and holding down the tongue, but they are wholly inapplicable in practice; even were it justifiable, it would be found next to impossible to force and keep open the mouth even of a child against its inclination, so as to conduct any delicate or troublesome operation to a satisfactory conclusion. Some rare cases of pendulous and polypous tumours of the pharynx have been met with and narrated; they have been brought into view by producing inverted action of the stomach and gullet, and some of them have been removed by surgical operation. I have not seen any such cases, and cannot from experience give directions as to the most proper line of proceeding in regard to them; that must depend entirely upon circumstances; but I can conceive no difficulty likely to arise in carrying a ligature round its base, if the tumour can be brought into view, or placed within reach of the surgeon's fingers.

TUMOURS OF THE JAWS.

The morbid growths which involve the superior and inferior maxillary bones are of various kinds, and their structure and

disposition apparently depend somewhat upon the tissue from which they have originally sprung,—as the gum, the membranes of the teeth, the periosteum of the alveoli, the surface or the internal structure of the bones, or the membranous lining of their cavities. The most frightful tumours affecting these parts, which I have witnessed, have commenced in some of the neighbouring tissues. I have repeatedly seen malignant tumour of the lower jaw, which, on reviewing its history and progress, without doubt commenced in the soft parts; and the upper jaw, it is well known, is involved at an early period in the malignant degeneration of the contents of the orbit, or of the mucous linings of the ethmoid and other cells. Very many of the tumours of the jaws are traceable to faulty growth or position of the teeth, to disease of these parts, or to improperly conducted operations upon them.

The tumour of the gum, epulis, is often a simple growth of the same consistence as the structure from which it proceeds, and not likely to be re-produced when the exciting cause has been removed and the entire disease extirpated; its frequent cause is decay of some part of one or more teeth,—the crown, neck, or fang,—or it may arise from their being crowded and displaced. The lower jaw is the most common situation of epulis, but the upper jaw is by no means exempt from it; it usually appears in the front of the mouth, and occasionally at the root of the molares; some of the large tumours in my collection, removed along with the upper jaw, appear originally to have commenced in the alveolar ridge. The size and extent of epulis are various; it may be confined to the gum betwixt two teeth, or it may have been long neglected, and involved several; and it may be attended with alteration in structure of the alveolar processes of their covering. The disease is generally connected with affections of the permanent teeth, but it is also met with as a disease of infancy. About four years ago I had occasion to remove a very large tumour of this nature, along with several decayed temporary teeth and their alveolar processes, from the lower jaw of a boy of ten years, in the North London Hospital. It was doubtful, from the extent of the disease, whether or not it might be necessary to remove the whole thick-

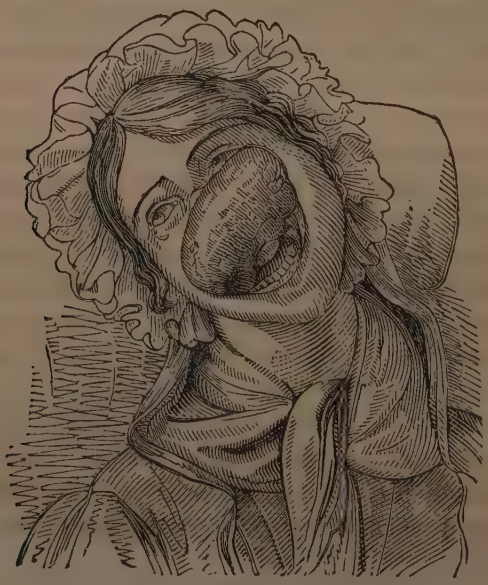
ness of the bone to some extent; accordingly, the cheek was divided so as to expose it thoroughly and permit a satisfactory examination, yet in such a way as to leave no deformity; the tumour was insulated, and removed by a small saw and cutting-forceps, leaving the crown and pulps of the permanent molares exposed; and the parts healed over them. There is now no appearance whatever of disease, and very little of any operation having been performed; the permanent grinders are coming forward, and appear quite regular and healthy.

The tumour of the gum is of slow growth, it generally remains of the same firm consistence, and its attachments are broad and firm; its surface, even when large, is covered by smooth membrane, and is often unbroken, becomes lobulated, and unless it projects from the mouth and is exposed to injury, the teeth are loosened and present in various parts of the tumour, and around their base some excitement may be kept up, with even some ulceration and discharge. The tumour is not of a malignant nature in general, and even in its advanced stages is not inclined to contaminate the parts in its neighbourhood; if thoroughly removed, it does not return. A soft tumour of the gum, rapid in its progress, broken on its surface, and furnishing fetid and bloody discharge, is said to be sometimes met with; there is no danger of mistaking the one kind for the other, the remediable for the malignant; and fortunately the latter is rare. I cannot recal to my recollection any case, that I have seen, of decidedly malignant disease springing from the gum.

The operation for the removal of epulis is modified according to the size and situation of the tumour; one or more teeth must always be sacrificed in order that the proceeding may be effectual. In general swelling and thickening of the alveolar ridge and its coverings, the mere removal of those bodies that are offending will often be followed by subsidence of all alarming appearances and uneasy feelings. But in order to extirpate

effectually any morbid growth proceeding from the investments and roots of the teeth, these must first be extracted; the growth is then surrounded by an incision made with a strong-pointed knife, and, if need be, part of the alveolar process is also taken away with cross-cutting forceps. If the tumour is of considerable size, and the alveolar process deeply implicated, it will be prudent, after having made the incisions and removed the teeth on each side of the disease, to cut down the bone with a fine saw, before applying the forceps. In order to gain free access to large tumours connected with the molares, it will sometimes be prudent to divide the cheek to some extent; the pain and duration of the operation will thus be much diminished, a better chance will be afforded of making the proceeding effectual, and if matters are well managed, as regards the direction of the incision and the after dressing, there will be little or no consequent deformity. This rather severe proceeding of cutting open the cheek is, however, generally avoided, if the operator is provided with strong and well-made cutting-forceps, slightly bent beyond the joint.

Tumours commencing in the gum, sockets, or surface of the bone, are sometimes neglected so long, are allowed to gain such



a size, and to take such a hold of the upper or lower maxilla, that the whole disease cannot be eradicated without at the same time taking away those bones in whole or in part. The superior maxilla, as already said, is often the seat of epulis, of unlimited growth, but still of a simple and benign disposition. I am almost inclined to believe that the case here sketched was originally of this nature. The tumour had been removed when recent, but only in part, and grew again, till after many years it presented the above very formidable appearance. It was extirpated successfully, as detailed in the "Lancet," vol. i., 1836–37, p. 237, and alluded to and figured in the "Medico-Chirurgical Transactions," vol. xx. p. 198. The superior maxilla of one side, and part of the other, were necessarily taken away, yet the disease seemed to have sprung entirely, in the first instance, from the alveolar ridge; it over-lapped the palatine arch and other parts of the bone, but these are unaffected; and the antrum, though narrowed a little, is quite free from disease, its lining membrane being entire and healthy. A sketch of the appearance presented before the patient left the hospital is introduced in the next page, to show how little deformity remained after so formidable and extensive an operation. The scars on the upper lip are the result of the previous unsuccessful attempt to remove the disease.

But the body of the superior maxilla is subject to diseases of a different nature; many of them originate in disorder of the teeth, but they occur also after external injury, and some appear without assignable cause. The enlargements are from fluid collections, or from solid growths, of various kinds; and these must not be mistaken, as they have often been. An inexperienced and unqualified person has screwed up his nerves to attempt removal of the superior maxilla in a public theatre, and, on trying to divide the connexions of that bone, has had his hands covered with purulent matter, and himself with confusion and shame.

Swelling of the upper jaw and cheek, of considerable size, follows acute inflammatory action in the lining membrane of the antrum; the parietes of the cavity are expanded and thinned, with great pain and deformity. Œdema of the soft parts of the

cheek adds to the prominence. After a time the secretion may find a partial vent by the side of one of the teeth, or into the nose; but the latter mode of escape is of rare occurrence. The discharge then takes place through an ulcerated opening, the natural one being small, unfavorably placed, and closed by turgescence of the Schneiderian membrane. The inflammation may have been caused by external violence, but is more generally traceable to irritation in the corresponding alveolar ridge. Removal of the offending teeth or stumps, with the formation of a very free and dependent opening, is followed by subsidence of the swelling, and in the end by cure. A very suitable aperture cannot well be made when the alveolar processes are entire. If the teeth are decayed, and absorption of their sockets has considerably advanced—or if, as is the case sometimes, portions of the alveoli are necrosed,—then, after the extraction of what is proper, a sufficient opening can easily be made by a triangular perforator. When, however, the teeth are quite sound, not crowded, and when their gums and sockets are perfect, we are scarcely warranted in recommending the removal of any of

them; and even if we did, but a very insufficient perforation could be so effected. In such cases it is better, after dividing the membrane of the mouth above the canine or first small molar, to perforate the cavity through its thin anterior wall; a small instrument is first employed, and the opening is enlarged by larger ones, until the point of the little finger can nearly be admitted; no repetition of the operation, and no trifling with injections or tents, will then be required. It is to be kept in view, that alveolar abscess may attain a considerable size in the neighbourhood of the antrum maxillare, without communicating with it; but such cases when neglected may, and often do, ultimately lead to collection in the natural cavity. In alveolar abscess, extraction of the faulty tooth will be followed by immediate relief and the subsidence of the swelling; and in recent cases it is well known that the cyst of the abscess, sometimes of considerable size, comes away attached to the point of the fang.

The accumulation forms very gradually in the cavity of the antrum, consisting of glairy fluid or of serosity, with some purulent and flaky matter, which latter subsides and occupies the most dependent part, as is the case in collections in various other situations. In some rare cases, the patient has not applied for relief, until the end of several years from the period at which the cheek has begun to feel uneasy and to change its form.

Not long since I met with a very interesting case, along with my friend A. Nasmyth, in the person of a young lady aged 17. The teeth were very much crowded in front, and the right cheek had been swelled for a considerable time. On extracting one of the molares to make room in the mouth, some very fœtid matter had escaped, but in small quantity, and without subsidence of the tumour, or abatement of the uneasy feeling. A kind of fungous growth had sprung from the socket, and the corresponding nostril also became obstructed by a soft growth. The case altogether bore a most unpromising appearance. In consultation with Mr. Travers, it was agreed to extract the tumour from the nostril; the fungous mass was also removed from the alveolus, and from it some thick and very offensive matter es-

caped. An immense quantity of lardaceous stuff was thrown into the nostrils and throat, by forcible injection of tepid water through the opening in the mouth. The cavity was washed out repeatedly, the discharge abated, the swelling decreased, no farther fungus appeared from either opening, and the case terminated in the most satisfactory manner.

A new and adventitious secreting membrane lines the interior of the cavity, and the tumour may partake of the nature either of a chronic abscess, (lymphatic, as Kirkland has named it,) or of a serous encysted tumour. The parietes of the cavity are much expanded and thinned; at some points the bone almost disappears, as it does under the pressure of the solid growths, its place being supplied by a thin but dense membrane; it yields under firm pressure, and, like parchment, resiliates with a crackling noise. The removal of decayed portions of teeth, if any exist, and a very free opening somewhere in the bottom of the cavity, must be resorted to in many of these cases; a bistoury will often be sufficient for the purpose, a portion of the attenuated bone and membrane being thus easily removable. In several cases I have found, after a time, well-applied pressure, with compress and double-headed roller, useful in restoring speedily the side of the face to its natural form and size.

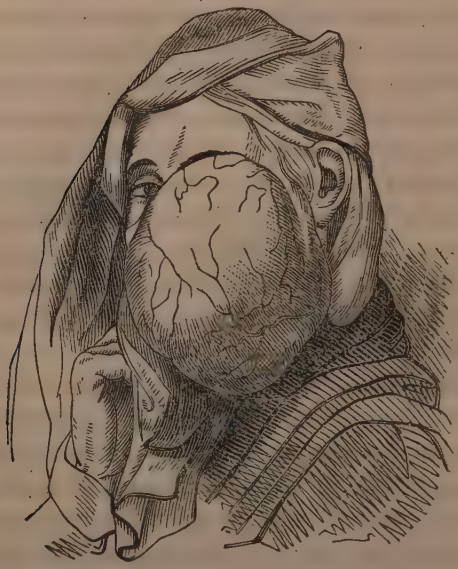
But, unfortunately, the maxillary antrum is more frequently the seat of a soft, brain-like, and malignant mass, than of this chronic collection of fluid. No age or sex is exempt from it; and when it has fairly declared itself, and has begun to appear through the parietes at any point, it is irremediable. This disease seems to be sometimes connected with the soft tumour which grows from the apex of a tooth, and from the investing membrane of the fang. Generally, however, it originates in degeneration of the mucous membrane lining the cavity, which it rapidly fills. In the first stage, which may exist for some months, the cheek is prominent and bulging; it has the same smooth appearance as is presented by the chronic fluid-swelling, and the integument is, for a time, as loose and free from infiltration. The parietes are hard and unyielding, but a softened part may perhaps be detected in the palate, cheek, or towards the tuberous process; this yields to the finger, and affords a pulpy

feel; whilst the same elasticity as described in speaking of fluid tumour is not perceived. Some considerable time may elapse before the tumour bursts through the parietes; and, before it does so, it has generally pushed its attachments backwards, filled the cell of the palate-bone, involved or contaminated the lining membrane of the ethmoid cells, and perhaps even that lining the sphenoidal sinuses. The patient has, during all this time, suffered a dull uneasy feeling in the cheek, a sensation of fulness and distension. He then begins to find the corresponding nostril obstructed; and, probably, then only applies for advice. On examination, the cavity will be found occupied by a soft mass, irregular and easily lacerable on its surface, when broken furnishing blood, and at all times exhaling a copious sanious discharge. After having burst through the parietes of the cavity, its progress is rapid and uncontrollable. Portions may be removed by the knife, ligature, or cautery, either potential or actual, but nevertheless the onward course of the tumour is continued. The teeth become loosened and fall out; the tuberous process is bulged backwards; the eye is found protruded, in the advanced stages, upwards and forwards; soft fungous masses, sometimes bleeding profusely without external injury, show themselves to a frightful and disgusting extent, in the mouth, throat, and orbit; the features are terribly distorted; the patient becomes hectic, and dies very miserably. In the very earliest stages of this disease, before there is reason to suppose that it has extended much backwards, it may perhaps be warrantable to attempt its entire extirpation, and thus afford the patient the only chance of escape from so certain and miserable an end. The opening of the cavity, with an attempt to clear it of the soft pulpy mass, as formerly practised, is totally inadmissible; it is, in truth, unmeaning and utterly useless cruelty. If anything is to be done, it ought to be undertaken with a thorough determination to go beyond the limits of the morbid growth, to remove the cavity which holds it, and thus get quit, if possible, of all the tissues implicated, or which may have become disposed to assume a similar action. I know from experience that this step, if adopted in time, may prove successful; and though at least a doubtful and very severe proceeding, not by any means

unattended with danger, it is the only remedy. Let it be borne in mind, that it is only in the very earliest stage that any benefit can accrue even from the thorough extirpation; very generally, the case is not presented, until much too late, to one who understands the nature of the malady, who is capable of undertaking its treatment, and who has courage to propose and perform what is necessary. After the parietes have given way, and the growth has appeared in the nostril or cheek, the case is hopeless; and the patient, as of old were those who ventured on the ocean, may be numbered with the dead. A section of this tumour presents the bony cavity expanded and absorbed, and the cells filled with brain-like matter. This appearance may be tolerably uniform, as well as its structure throughout; or there may be softer parts of the consistence of cream, putrid and mixed with masses of broken-down bloody clot, and here and there albuminous matter may be met with; altogether, it well deserves the terms applied to it by Pott, "a strange, distempered mass." Erectile tumour, it is said, has been found occupying the cavity of the antrum of Highmore. I have not encountered any such case, but many of the tumours which have come under my notice in this situation have been hæmatoid, have thrown out a fungous growth of bloody appearance, and furnished blood to an alarming extent; the hæmorhages, being moderated with great difficulty, hurried on the fatal termination.

A tumour of a very different and much more manageable nature forms here. It is in general, though not uniformly, the result of external injury; it is slow in its progress, and of very firm consistence; its surface presents a lobulated or botryoidal

appearance, and is unbroken, even in advanced stages. If exposed to injury or irritation, it may be slightly ulcerated; but the cause having been removed, the solution of continuity in the investing membrane is repaired. The internal structure is homogeneous, and not very vascular; it is fibrinous, and sometimes distinctly fibrous; and here and there spiculæ of bone or portions of earthy matter are felt in making a section. The whole mass is limited and surrounded by a dense cellular cyst; the neighbouring bones are displaced, and may, from pressure, be attenuated by interstitial absorption. In tumours of this nature, of long standing and large size, the zygomatic arch will be found thinned and converted into membrane,—as also the parietes of the orbit, and even the articulating processes, the ramus and the body of the inferior maxilla. This firm and comparatively benign growth has its origin in the bone and its investing membrane; for the one cannot well be much affected without the other. It may commence from the outer surface of the parietes of the antrum, in any part of the alveolar ridge, and may, in the first instance, as in the case alluded to and figured at page 306, be of the nature of epulis; or it is possible that, in some cases, the inner fibrous lining may be primarily affected; the antrum may be obliterated, its walls may be squeezed together, but the mucous lining is unaffected. This membrane may be seen, in some specimens, with its surfaces in contact, smooth and dry, the performance of its functions being no longer called for; in others, when the tumour has gained an enormous bulk, the cavity will still be discerned, but little narrowed, and with the mucous membrane in its healthy state. To give an idea of the unlimited growth and monstrous size which these tumours attain, without any contamination of the neighbouring parts, the sketch of a patient is here introduced, on whom a most successful operation was performed and permanent cure effected some years ago. This tumour was attributed to a severe blow on the cheek, and had been gradually increasing for six or seven years; the old lady is now alive and in good health. The case, along with others, is recorded fully in the Medico-Chirurgical Transactions, vol. xx. The extirpation of this form of solid growth may be undertaken with confi-



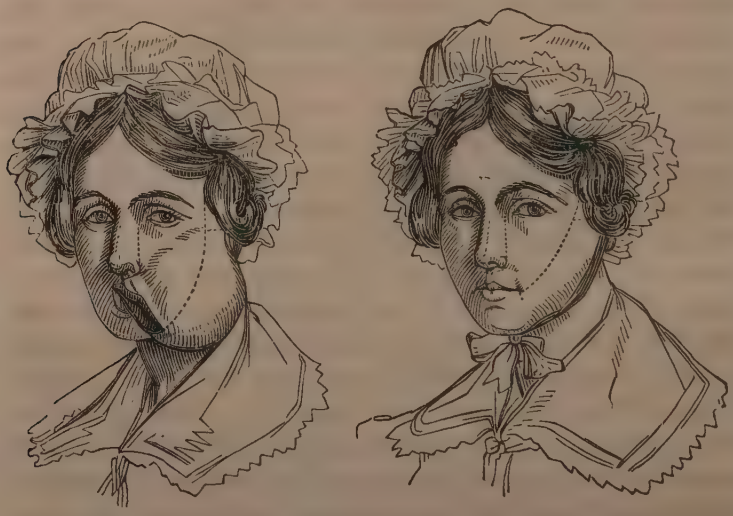
dence, and with every prospect of ultimate benefit to the patient. As in every case of operation, great and small, it is attended with a certain degree of immediate danger: but the patient and surgeon are warranted in incurring the risk, in order to get rid of a disease so troublesome from its situation, and which, by its increase, must eventually shorten the patient's existence. In the advanced stages even of this simple tumour, as can readily be understood, when the velum is covered and the pharynx almost filled, great inconvenience must be felt by the interruption to both deglutition and respiration. The suffering becomes intolerable, and if the patient can be assured that by an operation the whole disease can be extirpated, and that he will afterwards enjoy an immunity from it, he will readily be induced to undergo the pain, and take his chance of getting over the immediate effects, the loss of blood and the shock. If the proceeding is conducted in a business-like manner, if the attachments of the bone in which the mischief commenced are separated, and the incisions made clear of the morbid structure, very little blood is lost, and the time occupied will be inconsiderable.

Half measures are not admissible here. If the tumour be cut into, instead of being cut beyond, there must necessarily ensue vast and alarming loss of blood, together with unwarrantable delay, and all to no purpose. Several of the patients on whom I have operated successfully, had been previously subjected to severe and ineffectual attempts at extirpation. The tumours had been nibbled at, portions grubbed out, and caustics and cauteries applied, till the patient was all but exhausted. The diseased action, aggravated by these attempts, proceeded with greater activity than before; but a cure was ultimately accomplished, under much more unfavorable circumstances, by the adoption of decided and effectual measures.

The operation for the removal of these formidable tumours, involving the bones of the face, must be well planned and considered beforehand, and proper instruments provided for the purpose. The extent of the disease is to be accurately ascertained, and the points at which the bones require to be separated decided upon. If the os malæ be involved, and it is necessary to remove it as well as the superior maxilla, a pair of straight tooth-forceps, a full sized bistoury, copper spatulæ, powerful scissors, artery forceps, and needles for interrupted and twisted suture, will be sufficient. If the superior maxilla only, with perhaps some of the smaller bones, is to be removed, then the addition to the apparatus of a small saw will be necessary, for the purpose of more readily effecting the separation of the os malæ, somewhere near its anterior attachment. The proceeding is not to be dreaded on account of its extent; indeed removal of the superior maxilla alone is the more troublesome.

Supposing that the more extensive extirpation is required, incisions must be made so as to expose freely the tumour and bones where it is proposed to cut them. First of all, one of the central incisors must be extracted, either the one on the affected side, or the other, according to the extent of the tumour. I have been obliged to remove a considerable portion of the jaw, opposite to that principally affected; and in that case one of the molares was removed, in order to admit of the division of the bones. The point of the bistoury is entered over the external

angular process of the frontal bone, is carried down through the cheek to the corner of the mouth, and is guided by the fore and middle fingers of the one or other hand, as may be, placed in the cavity. A second incision, made along and down to the



zygoma, falls into the other. Then the knife is pushed through the integument to the nasal process of the maxilla, the cartilage of the alæ is detached from the bone, and the lip is cut through in the mesial line. The flap thus formed is quickly dissected up, and held by an assistant; the attachment of the soft parts to the floor of the orbit,—the inferior oblique muscle, the infra orbital nerve, &c.—are cut, and the contents of the cavity supported and protected by a narrow, bent copper spatula. The division of the bones is now undertaken; with the cutting forceps, the zygomatic arch, the junction of the os malæ and frontal bone by the transverse facial suture, and the nasal process of the superior maxilla, are cut in succession; then, a notch having been cut out of the alveolar process, the palatine arch is clipped through by strong scissors placed along it, one blade in the nostril of the affected side, the other in the mouth. Then it is that an assistant will be prepared to place his fingers on the trunk of one or both carotids; but pressure on both at the same time must be

made with caution, for reasons given at page 201. The tumour is now shaken from its bed, and as it is turned down, the remaining attachments are divided by the knife; the velum palati is carefully preserved, and also, if possible, the palatine plate of the palate-bone. Perhaps no vessel may require ligature, the branches of the internal maxillary having been elongated, and torn from the tumour; in fact, if the mass is large, there is no possibility of reaching these vessels with the knife. The patient is now removed from the sitting posture, which is the most convenient for all parties during the operation, and laid on a couch or table. The cavity is sponged out and examined; if any vessel is seen hanging in the wound, though it does not bleed, it may be tied, and the ends of the ligature cut off. The space which was occupied by the tumour is then filled with lint, and the edges of the wound brought together by points of interrupted or twisted suture, but no dressing should be applied; so far as I apprehend, it can answer no good purpose to wrap up the face in pledgets, plasters, and bandages. After twenty-four hours, some of the sutures may be taken out, and replaced by narrow strips of plaster; and at the end of forty-eight hours the remainder of the stitches are cut, and the needles withdrawn—the whole track of the wounds, which will in all probability have adhered, being properly supported. A large void is necessarily left in the palate, but it is wonderful how soon and completely this is repaired, by the return of the bones to their original situation, and by the granulation and contraction of the soft parts. In many cases, little is left for the dentist to do. Articulation will be rendered more perfect, by fitting a plate of metal or sea-horse bone into the space; but this should not be attempted for a long period after the operation, and not until the natural closure of the part has ceased. The gums and alveoli that remain should be brought into a sound state, and indeed the mouth should be cleared of stumps before the greater operation is undertaken.

The two sketches introduced at p. 316, show the appearance of a patient before and after the removal of a solid growth, involving the superior maxilla and os malæ, nearly four years ago. The operation was performed, and the case is related at

length in one of the numbers of the "Lancet" for March, 1836, and the Medico-Chir. Transactions, vol. xx. p. 189. The patient now enjoys perfect health.

For erectile tumour occupying the maxillary sinus, ligature of the common carotid of the corresponding side would be the proper practice. But it is not to be supposed that this proceeding can have any effect in arresting the progres, still less can it be expected to lead to a cure, of those soft and malignant tumours described some pages back.

The surgeon, by studying well the nature and progress of growths in this situation, and in fact in all parts of the body,—by losing no opportunity of making examinations, and thus gaining the requisite tact,—will be able to predict their internal structure with tolerable certainty. He will not be under the necessity of resorting to what in many cases proves a very mischievous and hurtful interference, the thrusting into their substance of a long, fat, or round and grooved needle. I was consulted very lately by a gentleman labouring under a tumour occupying the floor of the antrum, who had shortly before suffered very severely in consequence of this idle curiosity; the action of the diseased part had been roused, and for some time after considerable increase of bulk had taken place. A day or two after this, there was presented at the hospital a case of tumour over the distal end of the ulna, of firm consistence and very painful nature, involving and compressing the dorsal branch of the ulnar nerve. There was cicatrix resulting from a punctured incision upon the skin covering it. The nature of the case was represented to the young woman, and extirpation recommended. She returned to have this done in two days, with a fresh mark of puncture upon the tumour. The operation was performed, and inquiry then made as to how this second mark had been made. She confessed that she had in the interval gone to another hospital for advice, had there the swelling explored, and suffered, in consequence, as she declared, much more pain than that caused by the extirpation. The tumour was of solid and dense structure, somewhat larger than a filbert, and had a nervous twig entering into it. On its section it bore the marks of the punctures, being at one point somewhat soften-

ed, and bloody in appearance. Some days since, I removed a tumour along with the little finger and its metacarpal bone, which had commenced in, and thoroughly involved, the proximal phalanx and adjoining articulation; it was soft, brain-like, and of a large size. The patient had suffered considerably, and the progress of the disease had evidently been hurried on by no less than eight or nine punctures, made at different periods. The practice of thus exploring tumours may be warrantable in some few very obscure cases, in which the diagnosis would otherwise be difficult and imperfect, but its general and indiscriminate employment by all practitioners cannot be too much or too strongly deprecated, as leading to any but favorable results, so far as the comfort and welfare of patients are concerned. I had recourse to the practice lately in a very obscure case. A middle-aged woman was admitted into the North London Hospital, labouring under a large tumour situated in the lower part of the abdomen, and filling the pelvis. The bladder was displaced, and occasional retention of urine took place; difficulty was always experienced in introducing a catheter, and it was necessary to depress the handle so as to convey the point of the instrument close to the symphysis. Indistinct fluctuation, it was supposed, could be detected by pressing alternately on the tumour above the pubes, one finger being placed on the projection in the vagina, the other on the external swelling; the os tincæ could neither be felt nor seen by the use of the speculum. A large grooved needle was introduced in the vaginal tumour, and a small quantity of pus was perceived. This was immediately followed by a large flat trocar, and nearly three pints of well-digested pus evacuated. The patient ultimately died; the cyst was found connected with one of the ovaries, and contained, besides matter, a large ball of hair—no uncommon occurrence.

The morbid growths, which proceed from and involve the lower jaw-bone, are also of various kinds and consistence; the more that these or other tumours of bone, differ from the original tissue, the more are they to be suspected, the more apt are they to follow a rapid and unfavorable course, and to be reproduced after removal, either in a part of the bone or discolored

integument which may have been left, or in the soft parts which have invested it. The most simple tumour is that of a fibrous or fibro-cartilaginous character, which has its origin on the surface of the bone or periosteum. It may be produced by external injury, or may be traced to inflammation, commencing in the sockets of the teeth and their investing periosteum and gum, and perhaps succeeded by suppuration, repeated from time to time. The case is at first one of simple parulis; but, the cause being permitted to exist, thickening from repeated inflammatory attacks takes place. Although the excitement be at this stage removed, the crowded teeth and decayed portions having been extracted, the diseased action is often not arrested. The solid, hard, and unyielding swelling, gradually progressing, at last begins to appear externally, and produces deformity; it bulges also into the mouth, and impedes the free action of the contents. After a time, more and more of the alveolar ridge, and of the body of the bone, becomes affected, and the teeth are displaced and loosened.

There is a risk, too, of the morbid mass changing in its action from the simple to the malignant form, degenerating and softening, rapidly increasing, and contaminating the neighbouring tissues. Many other tumours of the lower jaw are from the first of a suspicious character, and their onward progress is alarmingly rapid. They commence between the lamellæ of the bone, very generally, as a consequence of the irritation of stumps, and the formation of soft fungous masses from the apices of diseased teeth. Cysts containing serous or glairy fluid are often met with in these masses. The plates of the bones are expanded, thinned, and soon involved in the morbid structure. Tumours, whether of the firm or soft kind, have their seat most frequently in that part of the bone which lodges the molares. The swelling may extend from near the symphysis to the angle; it may even spread beyond the mesial line, or involve the greater part of the ramus. No therapeutic means, general or local, can check the growth of such disease, far less promote its discussion. Recourse to the knife offers the only hope to the patient; and the earlier this step is taken, and the more free the resection of the bone is made, the greater will be the chance of a favorable termination,

and of a thoroughly permanent cure. There is more danger attendant upon removal of the symphysis, than on excision of the ramus and articulating processes. For the detachment of the anterior belly of the digastric, and of the genio-hyoid and genio-hyo-glossi muscles, is apt to be followed, unless great precautions are taken, by retraction of the os hyoides and tongue, and sudden interruption to respiration. In some of the smaller and more simple tumours of this bone,—in that, for instance, described under the name of epulis,—it may be possible to save the lower rim of the bone, as in the case detailed p. 305, and thus more effectually prevent deformity arising from the drawing of the chin to one side. The bone on each aspect of the tumour is cut down with a fine saw, to a sufficient depth to admit of the safe and effectual application of a pair of cross-cutting forceps. A free exposure and examination of the part must be made, so that no doubt may remain as to the perfect soundness and integrity of the portion that is left.

[The accompanying cut shows the manner in which the bone is to be divided, when its lower edge is free from disease and the dental rim only is to be removed.]

With a view of exposing the bone, so as to effect partial removal, to perform resection, or to effect disarticulation, the in-

cisions must always be so planned as to leave as little deformity as possible. The line of the wound is here seen upon the tumour, and its cicatrix after the cure. To illustrate the operation, we shall suppose that the tumour involves nearly one side of the bone, and that division near the symphysis with disarticulation is to be performed. An incision is made from the condyloid process, down the posterior border of the ramus and along the lower margin of the bone, and terminates above the point of the chin, in the mesial line, at about an inch from the free edge of the lip. The flap so formed is dissected up, the mem-

brane of the mouth is divided on each side of the bone, and the tumour thus perfectly exposed. Another incision about an inch and a half long may then be carried in the course of the external carotid, and made to meet the other opposite angle of the bone. A tooth, say the central incisor of the affected side, having been previously removed, a small saw is applied so as to cut the bone to the required depth near the symphysis; the cutting forceps are placed in the notch, and the bone clipped through. The cut end is now laid hold of, the tumour depressed, and the attachment of the temporal muscle separated from the coronoid process. The masseter muscle has been detached along with

the coverings of the tumour. The bone having been thus thoroughly loosened, the articulation is opened from before; and, by carrying the bistoury close to the bone, the pterygoid muscles and other attachments are also divided, and the operation completed. The bleeding is now arrested by ligature of the vessels, and much time and trouble will often be saved by at once looking for and securing the common trunk of the temporal and internal maxillary arteries, as they emerge from under the border of the posterior belly of the digastric muscle. Effectual means having been taken for arresting hæmorrhage, a bit of lint is placed in the wound, and the flaps lightly replaced. About five or six hours after the operation, the edges of the wound may be neatly approximated and retained, excepting a short distance at the middle, to permit the passage of the ends of the ligatures. Through this opening the discharge of mucus, saliva, and serum, which are very fœtid, escape; and so swelling is prevented. Previous to the operation of resection of the jaw from tumour of the bone, it will be found of great use, as suggested by my friend, Mr. Nasmyth, of Edinburgh, to have metallic caps fitted to the teeth of the upper and lower jaws of the sound side. These are riveted or soldered together at their bases, so that, when applied, they shall have the effect of preventing the dragging of the remaining portion of the bone and chin, to the opposite side; by the external pterygoid, mylo-hyoid, and digastric muscles, and by the elasticity of the soft parts. This apparatus should be worn for many weeks after the operation, and has been found exceedingly useful in several of the cases in which I have performed disarticulation. An apparatus may be constructed to fill up the cavity left by the removal of the jaw, and to prevent the cheek falling in; it consists of a piece of bone smaller, but of the shape of the portion of jaw removed: this is fitted to the remaining teeth by means of caps, and a piece of gold passing inside the sound teeth. It should be placed in the mouth soon after the operation, otherwise the parts fall in and contract so much that very little room is left for any apparatus.

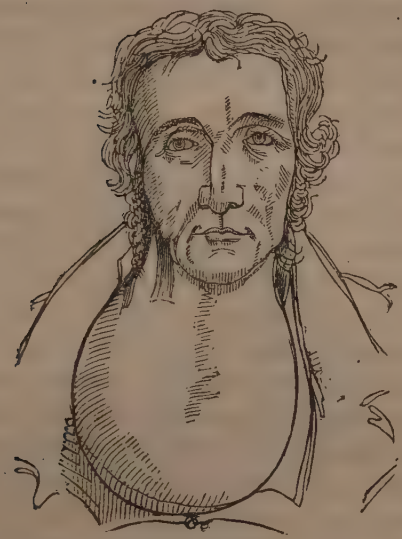
Cases have been from time to time brought before the notice of the profession, in which an entire bone of the jaw or clavicle has been said to be removed; these have turned out, after all,

to be but cases of necrosis, in which nature has played the principal part. The entire bone is seldom destroyed, it is well known. The mark of the incision, made as recommended above, can be almost completely concealed, more especially in the male.

As a general rule, the surgeon is more warranted in interfering with tumours of a suspicious character in the lower jaw, than of the upper; from the connexion of the bones of the superior maxilla, it is impossible to say that a tumour of malignant character is entirely extirpated: in the lower jaw, the disease, at its commencement, may be so completely surrounded by a bony or other cyst, that a surgeon would be warranted in resorting to an operation. But in these, as in every other tumour of the body, its character and history should be well considered ere we subject a patient to the pain of a severe operation. In tumours of quick growth, soft, and adherent to the skin, this being discoloured, and the veins on the surface enlarged, we should be very careful in recommending operations. From the undefined state of the disease, it is almost impossible to say that we can completely eradicate it; and in scirrhous, fungoid, and medullary tumours, the knife must not be resorted to without the most careful consideration.

TUMOURS OF THE NECK.

Tumours of the neck are variously situated, as regards their coverings, and the numerous important organ in that region. They may be superficial, and though of alarming and very inconvenient size, as shown in the next page, may have loose attachments, and be comparatively of harmless character. This tumour I removed, fourteen or fifteen years ago, from a very respectable middle-aged man, who, I believe, has since enjoyed perfect health. The swelling first appeared under his chin twenty-two years previously; and then his neighbours joked him about his jolly appearance, supposing that it was merely an accumulation of fat in the cellular tissue. It was fat certainly, but an adventitious and independent deposite. The patient himself, a plough and cart wright, attributed the origin of the swelling to the pressure of his brace. The tumour had gradually

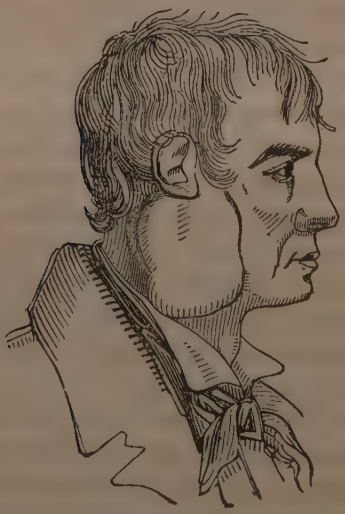


increased for twelve years or more, before he applied for advice. Its base extended from the chin to the sternum, yet after division of the integument, sufficient being left to cover the exposed surface, very little dissection was required. The various lobes of adipose matter were drawn from the loose cellular connexions, which, as they offered resistance, were here and there touched with the edge of the knife. Some of these lobes passed deeply by the side of the larynx and upon the sheath of the vessel, but all were placed above the deep fascia. I have removed successfully, without any very difficult or dangerous dissection, a variety of fatty tumours situated on the fore and lateral aspects of the neck, some fully equal in size to the one represented above. In fact, as the tumour attains great bulk and weight, the attachments are elongated, and the mass is thus removed from important parts. There is no difficulty, when dealing with these simple tumours, in saving sufficient integument.

The tumours which lie in either of the triangular spaces of the neck, bound down by the platysma-myoides and fasciæ, and dipping deeply, must be carefully examined, and their connexions well considered, before any attempt at removal is either

proposed or undertaken. Their consistence, duration, and probable disposition, ought to have considerable influence in guiding our decision. Immobility of the tumour may depend upon firm adhesions to the subjacent parts: or it may be in some measure accounted for by the tension and pressure of the coverings. These may be somewhat relaxed by position, and further examination instituted. Should the tumour have been of slow growth, if it present a firm consistence and defined margin, if it be tolerably moveable, and if there be reason to suppose that its attachments to large vessels, veins more especially, or nerves, are not very intimate,—then its extirpation may be attempted. This will be the more justifiable, when the tumour, by its bulk or awkward position, is beginning to interfere with the functions of respiration or deglutition. An instance of the most thorough and complete dissection of the side of the neck, and the greater part of both the superior and inferior triangular spaces, is already detailed in Chapter V. These irregular operations require, on the part of the surgeon, correct anatomical knowledge, prudence, coolness, decision, and some share of dexterity —qualifications to be gained only by practice and experience.

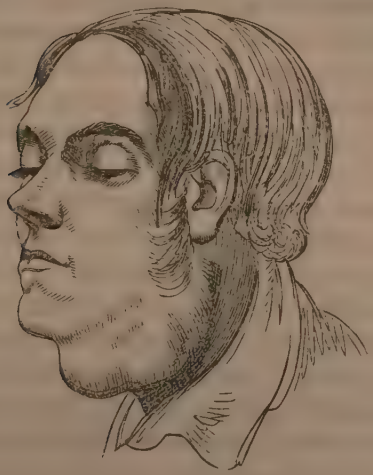
The tumours over the parotid, and behind the ramus and



angle of the jaw, deserve some notice. These, whether enlargements of the lymphatic glands, or adventitious formations, are bound down by a strong condensed cellular sheath or fascia, and also by the fibres of the platysma-myoides which pass upon the side of the face. This growth is equally extensive among the deep-seated parts, as it is prominent externally. The parotid gland is displaced and absorbed; the diseased mass is imbedded in its substance, and ultimately occupies its place. The vascular supply is abundant, and the nerves become intimately attached to the posterior surface of the condensed cellular cyst. The tumour is firmly fixed in all ways, by its strong investments and firm adhesions, and by its being, as it were, dove-tailed by its processes between the bones. Sometimes, after the removal of tumours of long standing in this situation, I have found exposed the whole cavity betwixt the mastoid process and the ramus of the jaw, the styloid and pterygoid processes, muscles, &c. The interference with these parotid tumours, as they are called,—though the parotid gland, I believe, is not in itself very subject to disease,—requires no small degree of consideration; if there be reason to suspect that the disease is of a malignant nature, and not thoroughly limited by a cellular cyst, no interference is admissible. If, on the contrary, it be at all moveable, has advanced slowly, possesses a smooth surface and is firm,—neither of stony hardness nor pulpy,—then the operation may be contemplated. A very free division of the super-imposed parts is essential to the success of the proceeding. For this object a perpendicular incision is first made, and others added so as to form two or more flaps; the incisions must penetrate to the substance of the tumour, and divide its immediate investments—it being a more easy matter to turn a diseased part out of its cellular cyst, than to dissect that from the parts to which it adheres, and from which it draws its supplies.

The dissection should be carried deeply to the lower boundary of the disease, where the vessels are known to enter; these will at once be divided and compressed; or they may be tied, either when very large, or when the fingers of the assistant are in the way of the further, and perhaps more delicate dissection. Thus the operation is pursued safely and satisfactorily, and it will be

found always much better to meet the danger at once, than to be obliged to tie one vessel after another, perhaps securing the various branches over and over again instead of the trunk; much less blood will be lost, the time occupied in the operation will be abridged, and the pain and suffering very much diminished; in point of fact, more may thus be effected, and with equal safety, in five minutes, than can be done in fifty when the proceeding is otherwise conducted. The utmost care must be taken to avoid the branches of the cervical nerves, and those of the portio dura of the seventh pair, by dissecting the posterior aspect of the tumour carefully, using the knife in the direction of their course, with its edge and point constantly turned towards the part to be removed; but, in some cases of this kind, division of part of the pes anserinus is quite unavoidable, and we have sometimes, in the midst of the proceeding, to decide between leaving part of the tumour, and causing a temporary paralysis of part of the face. The smallest fragment of the most simple tumour will form a nucleus for a fresh growth; there is no difficulty, therefore, in selecting the alternative. And the possibility of its being necessary to divide branches of nerves, and the effects of such division, must be made fully apparent to the patient before any attempt to remove the tumour is commenced. The character of a fibrous tumour in this situation is shown at p. 326. In the after treatment and dressing of the wound, the principles already laid down will be the surgeon's guide. Tumours of a fibrous nature are sometimes found underneath the jaw in the situation of the sub-maxillary gland, encroaching somewhat also upon the parotid, and passing between the stylo-glossus and internal pterygoid muscles, and are mistaken for enlargements of that body. The accompanying sketch represents a tumour in that situation. It was of slow growth, having existed for twenty-five years; it passed behind the mylo-hyoid muscle, projected somewhat into the mouth, and was, in a slight degree, in contact with the mucous membrane. The extirpation of tumours in this situation is effected by making an incision under and parallel to the jaw, another incision vertical to this, and, by dissecting back the flaps, free room is given for the further steps of the operation, which consist in dissecting

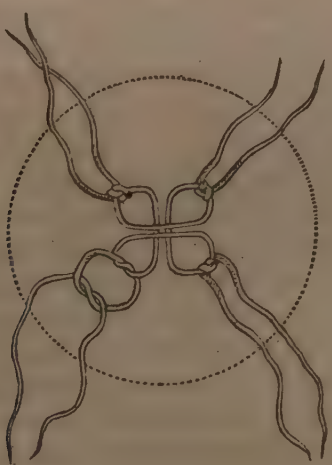


down to the tumour through its cellular sheath, and turning it out, occasionally dividing its connexion with the surrounding tissue. The edge of the knife must be uniformly directed to the growth. If friction or pressure has been employed, the parts will be more firmly connected, and the dissection more difficult. If care is taken, there is no necessity to divide parts of any importance. The facial vein may probably be cut across, and may furnish so much blood as to require a ligature. The facial artery lies so deeply under cover of the jaw, that if the operator is careful, it will not be wounded. The character of this tumour, as freed from its cellular sheath, is well given in the accompanying sketch.

Enlargements of the thyroid body cause much deformity, but they are generally unattended either by suffering of any kind, or by interruption to the functions of the organs which they cover and invest. The tumour is lobulated, soft, and apparently very moveable; it follows the larynx in its eleva-

tion and depression; its surface is covered by a loose cellular sheath, and by the expanded thyroid muscles; its arterial supply is excessive, and the veins are large and full. Any attempt to remove the mass by incision has, as might have been anticipated, been attended with frightful and, almost uniformly, fatal hæmorrhage. Ligature of the vessels separately has been attempted, but with no advantage. No operation is justifiable in such cases merely for the removal of deformity; but it happens occasionally that enlargement of part of the gland, as the isthmus or middle slip, gives rise to difficult respiration, to fulness of the vessels in the brain, and an alarming train of symptoms; under these circumstances, the offending part, if it have resisted the action of iodine and other deobstruents, may be made the subject of operative procedure. The introduction of a seton has been resorted to, but this practice is not unattended with risk, and its operation is slow and uncertain. By combining incision and ligature, I have more than once removed, with the most perfect safety, large portions of the thyroid body, which had caused serious inconvenience. The accompanying sketch exhibits the situation and character of bronchocele; the scar upon the surface marks

the situation of a tumour, nearly equal in size to that remaining, which caused much annoyance from its pressure and projection, and was removed in the manner here described. The coverings of the tumour having been divided fully and turned back, the dissection is continued towards the base of the mass, as far as it can be done with safety; strong needles fixed in handles, as represented, p. 336, are passed underneath, from above downwards,—and from the side, crossing the first at right angles,—care being taken not to wound or include any part of importance. Very strong ligatures are drawn through in the loops of the first introduced, and these are tied on each side; or the ends are secured all round, each one to that next it, whilst the others are tightly held. By pulling and securing the last very forcibly, all the knots are drawn together under the tumour, as represented in the following sketch; in fact, the four ligatures are knotted in such a manner as to make one, and, by drawing the last two ends firmly, the strangulation is rendered complete. The reef-knot must be used for this purpose, and even a third knot should be made, to prevent the ligatures slip-



ping during the firm and strong pull upon the last two ends. In passing the ligatures under these and other tumours, it is advisable to introduce the first needle unarmed, and beneath it

to pass a second carrying a ligature; the loop of the ligature is taken hold of, and this second instrument withdrawn; the first one is now threaded, and by its removal the second ligature is carried through; by this means their entanglement is avoided.

TUMOURS COMPOSED OF ERECTILE TISSUE.

Vascular growths,—tumours composed of a congeries of enlarged capillary vessels, or of the nature of erectile tissue, (so accurately and admirably described by Mr. John Bell, and named by him aneurysm by anastomosis,) can be removed with safety only in the manner here described. The tumour may occupy a situation,—as the orbit, antrum, or temporal fossa,—in which it is unapproachable and cannot be directly attacked, and then the experiment of cutting off the vascular supply, by ligature of the trunk going to the organ affected, may be had recourse to. The practice has been successful in the hands of Messrs. Travers, Dalrymple, and Busk. My excellent friend Mr. Miller, one of the surgeons of the Royal Infirmary of Edinburgh, informs me that he repeated this operation, but without any benefit accruing. Some years ago, I assisted a very good surgeon, Mr. Paul of Elgin, in securing the common carotid for a most extensive aneurysm by anastomosis of the scalp, and the progress of the disease was arrested by the operation. Both carotids have been tied in a somewhat similar case by Dr. Mussey, in America. Dupuytren records a case where the carotid was ligatured for aneurysm by anastomosis of the ear. A case is mentioned elsewhere in this work, in which both linguals were tied with partial success. When, however, the tumour can be partially insulated, and its circulation effectually and perfectly interrupted, so that the adventitious structure shall perish and be separated, a successful issue may be much more certainly predicated. The operative procedure must be modified according to circumstances,—the size and situation of the affection, and the tissue in which it is situated. The disease is met with in exposed parts of the body, most frequently about the head, face, and neck; it is seen on the trunk, on the parts of generation, and on the extremities; and I have often seen it involving the entire structure of a toe or finger. It

may consist merely of discoloration of the surface, more or less red or blue—a mother's mark, or nævus, extending superficially; it may involve the subcutaneous cellular tissue to some extent, or it may be situated entirely under the skin, with or without discoloration, forming a tumour, soft and doughy, or woolly and compressible. Some of the formations are much more active than others, and swell out when the circulation is excited, or when the passage of blood through the lungs takes place with difficulty; it is an affection most frequently treated in childhood, and generally increases with great rapidity.

Some of these tumours communicate a thrill to the fingers; they can be emptied to a certain extent by uniform and continued pressure, or by interrupting the circulation, and are instantly filled on permitting the blood again to flow into or towards them. The large ones pulsate synchronous with the heart's action. They are much increased in size by anything that increases the activity of the circulation, as the cries of children or the violent exertions of adults. On the application of the stethoscope, pulsation is heard as in common aneurysmal tumours, and a sound which differs from that of the common aneurysm, being rough, loud and whizzing, and which being once heard can never be mistaken. Some of the marks involve a considerable part of the mere surface, without any activity of circulation, and without any swelling, remaining in the same state during the whole period of life; perhaps the redness may become more intense when the circulation is excited by exercise or other means, and at particular periods in the female constitution. Accordingly a distinction must be made in practice betwixt the mere nævus, or discoloured spot without swelling, and the subcutaneous vascular or erectile tumour, with or without inclusion of the cutaneous tissue. Some of these marks cannot be interfered with, on account of their extent; if small, an attempt may be made to cause obliteration of the vessels in the surface, by vaccination on the spot, or by the use of nitric acid, potass, or other active escharotics. These and other means,—such as acupuncture, injection of stimulating fluids, and setons,—have been tried also in the subcutaneous tumour; and a partial cure may have been accidentally effected. But these plans are

not to be depended upon, and are at best very tedious; besides, serious consequences have followed some of the attempts at cure by such means.

I have seen cases in which most profuse and alarming hæmorrhage had followed boring into erectile tumours with strong potential cauteries, and in which, after all the pain, danger, and delay, no benefit accrued from the practice. In fact, I have been repeatedly called upon to interfere in cases where some nine or ten ineffectual attempts had been previously made by the methods alluded to above, and even by ligature ineffectually applied. Some few of these cases, as occurring in hospital practice, have been reported in the "*Lancet*" from time to time; and a long list might be added, if necessary. Pressure has been applied on the surface, but it has seldom been found possible to continue it long, nor has it ever answered any good purpose, even when the tumour was favorably situated. John Bell has strongly recommended excision of the affected tissue, and has well laid down the principle which should guide the surgeon in proceedings upon tumours so freely supplied with blood; cautioning him against cutting into or near the morbid structure, if he wish to avoid troublesome and dangerous bleeding, and to free the patient completely from the disease.

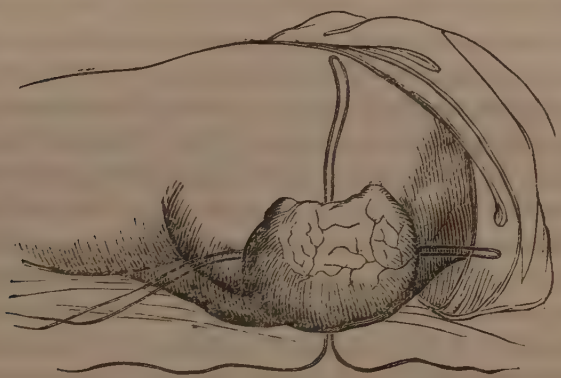
Some small and trifling erectile tumours, favorably situated, may be removed by the knife; but it is not a safe practice, and an instantly fatal result from hæmorrhage has more than once followed the attempt. In children it is seldom admissible, for, as is well known, they bear the loss of blood badly. The mode of removing this disease by ligatures was well known to Mr. Bell, and has been followed by Messrs. A White, Lawrence, and a variety of others: some cases, by these gentlemen, are published in the Medico-Chirurgical Transactions. When the skin is much affected, the strangulation of the mass by a single ligature, can only be effected by slow degrees; the tumour perishes from a certain degree of inflammation, the power of the part being diminished; and besides, deformity is often so produced. This is a very painful and tedious process, but may be accelerated by the application of fresh ligatures from time to time. The single ligature alone—that is, without preliminary

incision—is applicable in some instances, as where the diseased part is small and prominent, and when nearly the whole of its covering is involved.

The object must be to remove the adventitious tissue thoroughly, so that there shall be no return. Should it be impossible to include it entirely, or should some small portions be by chance left out, it may possibly happen that its vessels become closed by fibrinous deposite, but this is not to be depended upon; reproduction of the disease has too often followed operations thus imperfectly performed. The morbid structure will spring up again rapidly from a small spot, and the only safe and satisfactory plan will be found to consist in a thorough inclusion, by the ligatures, of every affected and suspicious part. When the skin is, of necessity, to be tied with the tumour, one or more ligatures are to be passed underneath. A double ligature is carried by a common suture needle, or by the instrument represented below, and recommended for the purpose in treating of bronchocele a few pages back. The loop is cut and one portion tied on each side; in order to make the ligatures embrace the base thoroughly, a second needle, or hare-lip pin, may be thrust across in the opposite direction, and removed after the threads are drawn and fixed under them; or the pin may be clipped short and left to come away with the threads and tumour. This mode I have followed with good success, for a series of years, and in numerous cases. When the skin is slightly or not at all affected, and the subcutaneous tumour is large, the covering should be turned back, as represented above, and the ligatures then employed. A few weeks ago, I operated for a tumour in this situation on a little girl who had been subjected to several unsuccessful operations previously. One needle, that across the morbid mass, was in the first instance introduced without a ligature, after the incisions had been made; the tumour was raised by means of it, and the second needle passed underneath the first, carrying a strong thread; the loop of this was laid hold of with a hook, and the needle withdrawn upon the ligature, as here represented. The first needle was then armed also, and the double ligature brought through with it. These were then secured in the manner described and delineated p. 331.

This mode is very superior to those generally followed, and is not liable to any objection. There is no risk of untoward bleeding in cutting through the skin, and dissecting back the flaps from the tumour. Of course these are made so as to leave any portions of skin, that may be at all affected, still attached to the part to be removed. The mass is thoroughly exposed, so that the ligatures can be introduced completely under and beyond it in all directions; and these can be drawn at once so tightly as to cut off its connexion with the circulation, and destroy its sensibility and vitality. The operative procedure is necessarily varied, according to the circumstances of each particular case. The principles being understood, the details must be left to the judgment and discretion of the practitioner concerned. After the tumour has been strangulated completely, free puncture may be made into it, so as to diminish its bulk. The painful feelings may be soothed by sedatives suited to the age and condition of the patient, and by warm water applied to the part, as described again and again in the foregoing pages. By following this method, the period necessary for a cure is much abridged; there is less suffering entailed on the patient, deformity is avoided, and the operation is without doubt more safe and certain than any other.

A case of tumour of the hip, of which the cut in this page gives a very accurate idea, was brought to the hospital, in the summer of 1837, by my old friend and pupil, Dr. C. Underwood of Ross. The patient, aged 67, had for some time perceived a small tumour, of the size of a nut, upon the right hip. He attributed it to the irritation caused by a truss, which he wore for a large and troublesome hernia. The swelling had gradually increased, causing great pain and uneasiness, until it attained



the bulk of two fists. It appeared to consist of a congeries of blood-vessels, which pulsated distinctly. By constant and equable pressure the tumour could be lessened to half its dimensions, but, upon the pressure being removed, it quickly resumed its usual condition. Some weeks before he was brought to the hospital, an incision was made wide of the swelling, with the view of afterwards embracing its base by ligatures; but the hæmorrhage was so violent and alarming, that after it had been arrested, as was done with difficulty by the application of the actual cautery, the attempt to remove it was for the time abandoned. Instructed by this occurrence, and after mature deliberation, along with Dr. U., I determined upon attempting its extirpation. The mass was lifted from the subjacent muscle, and a long and strong needle thrust under it; another, armed, was passed across in the opposite direction; and small and firm whip-cord was drawn through by means of the silk ligatures

carried by the needles, as shown in the figure. These having been arranged, an incision was made through the skin, betwixt two of the ends; and these were tied firmly, whilst the others were held tight. They were then tied round in succession, incisions being made betwixt their points of insertion, so as at once to strangle the enclosed mass. This operation was effected with the loss of not more than three ounces of blood, and much more effectually, and with less pain, than if the incisions had been omitted. The skin covering the tumour was firmly adherent throughout, and pervaded by enlarged vessels, so that none of it could be saved. The exposed surface was therefore large, and slow in healing; the chasm was also deep, the fibres of the glutæus maximus being deprived of their fascia. The appearance of vascular tumour, at this period of life, is uncommon; and this one came up to the description given by the late Mr. John Bell of aneurysm by anastomosis, more thoroughly than almost any other I have seen, as regarded the active pulsation, the compressibility, and the hæmorrhagic disposition of the vessels going to it. The patient returned to Herefordshire, some time ago, in tolerably good health, and without the slightest appearance of any regeneration of the morbid growth; he died in the summer of this year (1840) anasarcous, after an attack of bronchitis. He never had any return of the local disease. Tumours of this nature, and of so large a size, are not so frequent in adults as in young children. I saw, however, a short time ago, a very large erectile tumour of the neck, which was considered by some surgeons an aneurysm of the subclavian. The tumour had commenced at the posterior part of the neck, and gradually increased forwards until it reached nearly to the clavicle. It pulsated synchronous with the heart's action. On the application of the stethoscope, it gave the peculiar rough whizzing sound of erectile tumour. It could be squeezed and apparently very much emptied of its contents. No part of the skin was involved; indeed the tumour appeared as if it was situated underneath the fascia of the neck. On account of its very large size, and from the difficulty of knowing how deeply it might extend, it was determined, in consultation, that no attempt should be made for its extirpation.

TUMOURS OF THE MAMMA.

The female breast is unfortunately the seat of disease, very often of such a nature, and in such advanced state, as to be perfectly irremediable, even by surgical means. The mammary gland of the male is also affected in a similar manner: though far more rarely, for reasons well understood. The enlargements and indurations of the mammæ, in young persons, can in general be removed by attention to the general and female health. The affections of the gland, which show themselves in latter life, at or before the critical period, may likewise be thus palliated, and somewhat retarded in their progress. Some simple enlargements may become quite stationary, and cease to cause inconvenience or anxiety, whilst others may even be induced to disappear entirely, by judicious management, and by a perseverance in general and local means. But the greater number of these tumours, as is well known, sooner or later, exhibit signs of malignant action. The hardness increases; the nipple is retracted, and fixed to the body of the gland. The skin and lymphatics become contaminated; the form of the breast is lost; the gland often shrinks, and contracts adhesions to the adjacent parts, or it enlarges rapidly, presenting a smooth and uniform, or an irregular and lobulated surface, and feels soft and pulpy. Ulcerations take place at a late period, either on the surface round the nipple, or elsewhere, in consequence of the progress of some bloody and unhealthy secretion from within.

It is impossible to enter here on any description of the internal and intimate structure of these morbid masses. The progress, appearance, and feel of the tumour, coupled with the period of life at which it has formed, will leave no doubt in the mind of the practitioner as to its nature. We have, as yet, no certain means of freeing a patient from a cancerous, encephaloid, or cystic degeneration of this or other organs. Recourse may be had to the knife in some cases; but the circumstances must be very favorable indeed, to induce a surgeon to recommend, or warrant him in undertaking, any operation for the removal of malignant disease. It is only in the very early stages, before

the skin is involved, and when as yet no trace of affection of the lymphatics can be detected, that any permanent benefit can be expected to accrue from extirpation of the affected mamma. When the disease has been of some standing, there is considerable risk of the axillary glands having become contaminated, and of their assuming the diseased action at some future period,—many months, or even years, after the excision of the original disease. No one could now be found so rash or cruel, as to attempt the removal of glands thus affected, whether primarily or secondarily. After the lymphatic system has been tainted, there is no possibility of either ascertaining or getting beyond the limits of disease. But we occasionally see tumours of the breast very different in character to that of schirrhus, and which can be removed by the knife with every hope of a permanent cure. These tumours commence generally under, and not in the gland; they increase gradually, give no pain, the skin and nipple is neither retracted nor adherent, the tumour is heavy, perfectly moveable, and evidently surrounded by a cellular cyst. It is lobulated on examination after its removal; it is of a fibrous character, with little cysts contained in it. Hence the name Cystic Sarcoma.

When it is found necessary to excise the mammary gland, the patient should, if possible, be placed in a sitting posture, well supported by a nurse or assistant, in order to prevent her from slipping down; to prevent this accident, a jack-towel may be placed over the fore part of the pelvis, and tied behind the chair. The surgeon and assistants place themselves conveniently on each side; if he can use either hand equally well, the operator may always stand behind the patient, so as to be out of the way of the bleeding-vessels, by which his sight might otherwise be occasionally obstructed, and the operation consequently interrupted and protracted. The skin having been stretched, an incision is made from over the border of the pectoralis major, somewhat in the direction of its fibres, and under the nipple. The surgeon or assistant then puts his fingers on the part to be extirpated, and another incision is carried from the end of the outer third of the first cut to the beginning of its inner third, so

as to include the nipple in two elliptical incisions thus:—What-

ever part of the gland is affected, the nipple must always be removed, as diseased action is exceedingly apt to be therein reproduced.

The extent of the two incisions, and the points at which the one falls into the other, must depend upon the size of the tumour, and on the degree to which adhesion around the nipple has taken place. The first and essential object, in operating on cases of suspicious or decidedly malignant disease, must be to rid the patient of the whole of the morbid mass; the next is to make the incisions in such a manner that they shall come together readily, that they may adhere and heal rapidly, or at least that as small a surface as possible may be left to be repaired by the granulating process. The dissection of the tumour is accordingly proceeded in with care, and abundance of its cellular and fatty investments must be included; it should be raised, and the lower and outer surface thoroughly detached; and the incisions should be made deep at once where the principal vessels enter. These are compressed, after one side has been well separated down to the subjacent muscle; and the attachments of the upper part are in like manner divided by a few sweeps of the scalpel or broad bistoury, great care being taken not to encroach in the least upon the disease. The cut surface of the part, after its removal, must be wiped, and examined most scrupulously and minutely; if any shred of morbid structure is left in the cut surface, and if there is a suspicion of any part at all altered still remaining, that must be discovered by compari-

son with the divided parts, and forthwith removed without hesitation. This is a disease in which no half measures will answer; and if, after a severe struggle, a patient has made up her mind to submit to the pain and risk of a very dreadful operation, in the expectation of saving herself from after suffering, and enjoying an immunity from a terrible disease, it is not fair, by slovenliness or carelessness, to throw away a chance, or in any way to endanger recurrence of the mischief. The operation is one which must be conducted deliberately and conscientiously; as, indeed, ought to be the case in undertaking operations of any kind, and in any situation. The duration of the proceeding must not be considered. Many operations can be done well, and quickly too, and fully as well when quickly. But this is not one of these; the extirpation should be performed with a thorough determination to free the patient from the whole of the diseased structure. There should assuredly be no unnecessary delay, no tumbling of the tumour first on one side and then on the other, and no stopping to tie vessels. The dissection should be proceeded with methodically and deliberately, the parts being examined by the fingers and eye as it proceeds; and, as already stated, after the mass has been taken away, it must be washed and examined minutely. With all due caution and deliberation in the proceeding, it may be completed within a very few minutes; but, I repeat, the time occupied must not enter into our consideration. The diseased parts having been entirely removed, all the vessels that show themselves are tied. The arm which has been held abducted during the operation, in order to keep the parts in a favorable position, and on the stretch, is now placed by the side, and supported by a sling; a point of suture or two may be inserted, and cold water applied. The oozing having ceased, a few plasters are put on, but complete adhesion need not be expected, it being impossible altogether to prevent motion of the parts. The stitches are early removed, and the warm water dressing applied, followed by lotions, and gentle support from bandage and compress below the incision. Dressings and bandages will do harm in the first instance, and cause great annoyance.

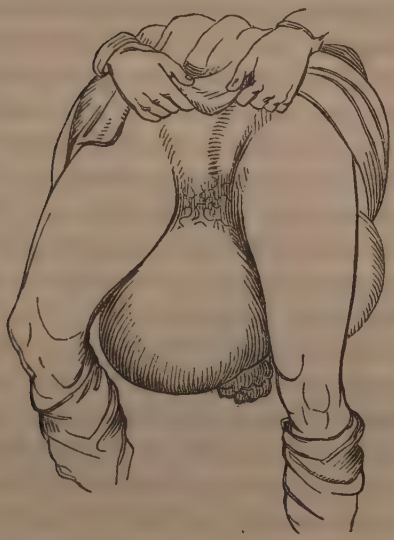
TUMOURS OF THE TRUNK AND EXTREMITIES.

The tumours met with on the trunk of the body are entirely new formations, and are generally of a benign nature. For example, the adipose tumours are met with on all aspects; they are generally subcutaneous and loosely connected, and sometimes attain an enormous bulk. Occasionally they are pendulous; I have met with two such betwixt the scapulæ, which, from pressure, seemed to have changed their structure; they had become pulpy and brain-like. These tumours are occasionally inflamed and condensed from pressure, contracting very firm adhesions; and from the application of stimulants and escharotics, the same unfavorable changes take place. In several instances I have experienced difficulty in extirpating adipose tumours from the back of the shoulders and neck, in consequence of their having been thus altered in their circumstances. They are sometimes, though rarely, met with betwixt the layers of the abdominal muscles; but are not to be mistaken for chronic abscess, which occurs also in this situation; the duration, the consistence, and some hardness about the base, will mark the fluid collection. Experience and tact, however, are essential in forming a diagnosis in such cases. The chronic abscess at the lower part of the region shifts its place: it often lies betwixt the muscles and transversalis fascia; and after a time, slips under the ligament of Poupart, betwixt it and the crural arch, and separates the two layers of the iliac portion of the fascia lata. It thus appears outside, and superficially, to the femoral vessels. A fatty tumour does not follow this course.

Fibrous tumours are sometimes, though rarely, seated on the neck, and I have removed a few from the axilla. Upon the back I have more than once seen soft, medullary-looking growths. The tumours of the trunk, however, are almost always superficial, loosely connected, and generally pendulous and simple; they are easily removed, though they may have attained a large size, and are but sparingly supplied with blood. Skin is saved to cover the solution of continuity, and the incisions are made as much as possible in the direction of the fibres. The cure will generally take place by the second intention; the edges of

the wound may, however, be retained in contact for a time. I have often had wounds, made for the removal of fatty tumours from the shoulder, chest, and anterior part of the trunk, heal without the escape of a drop of matter. But on the posterior aspect of the neck or trunk this need not be looked for; accordingly the secretion of matter is favoured, and the part kept comfortable, by the simple water-dressing.

The solid tumour represented in the next page is occasioned by infiltration into the cellular tissue, with, at the same time, some hypertrophy of the skin of the scrotum and penis. The warty mass at the lower part is the prepuce so altered, together with the termination of the raphe. The tumour is a simple enlargement of the coverings of the testes and penis, which are buried in the mass. The disease is almost unknown in this country, and, so far as I know, the sketch is taken from the only case which has occurred in a resident native of these islands. The tumour had been growing for twelve years, when the patient, then about twenty-two or twenty-three years of age, applied for assistance. At his urgent request, I undertook amputation of the diseased mass, and it proved perfectly successful. This operation was performed many years ago; the patient now enjoys perfect health, and is capable of any exertion. The disease had commenced before puberty. It was impossible to say where the organs of generation were placed in the mass; if they could have been found and saved, I should not have been able to cover them; they would have thus been totally unserviceable; and accordingly, in this particular instance, I looked upon it as a matter of no great consequence whether they were preserved or not. In point of fact, I was more anxious to save the patient's life, than concerned about his organs of generation; in trying to save these, it was more than probable that I should have lost the man, from hæmorrhage and protracted pain. So impressed, I had the patient placed with his back to the light, and resting over the side of his bed; with a few strokes of a long bistoury, the mass was detached from the perineum and pubes, together with the testes and about two inches of the penis. After some arteries had been tied, he was laid in the recumbent position, and the



remaining vessels secured, to the amount of twelve or sixteen. Nothing occurred to interrupt his recovery. The tumour weighed nearly fifty pounds, and is to be seen in my pathological collection. Attempts have been made to dissect out the genital organs from similar growths, and to make a scrotum and other appendages; but the results have not been satisfactory. The disease is common among the natives of warm climates, in some of the West Indian and South Sea Islands, and often attains a much greater size than in this instance. Larrey met with several cases in his Egyptian campaign. A similar tumour grows from the labium pudendi, and I have had occasion to remove several of these; one composed of various lobes of great size, must have weighed, at least, ten or twelve pounds. After the tumours in this region attain a certain size, and become pendulous, their increase is very rapid indeed; the return of blood is slow, and infiltration goes on apace; their supply of blood is, besides, very ample, and this must be thought of in determining upon the operation. Encysted tumours also occur in this region of the female, of slow growth, and containing generally a brown, very fetid fluid, mixed with flakes. They are loosely connected, and easily turned out, without the re-

moval of their integument, or the lining membrane of the labium. Abscesses in this situation are commonly acute; and those of a chronic kind observe a different course than that of tumour, and have not the same uniform and globular or ovoid form; there is consequently no great risk of mistake in diagnosis.

The extremities are not very often affected by tumours of the soft parts, and when these do occur, they are of a simple kind, like those of the trunk. The shoulder is not unfrequently the seat of adipose tumour, and it is also met with in the upper arm; I have removed them of large size from under the fascia, and from the intermuscular cellular tissue. More than once, fatty tumours have been shown to me in considerable numbers, upon the upper extremity, which were stated to have appeared within an exceedingly short period—two or three months—and without apparent cause. I removed several of those which were awkwardly situated, and interfered with the motions or position of the limb, from a man in the Royal Infirmary of Edinburgh; yet some twelve, or perhaps twenty, must have remained. A patient, some time ago, was under the care of my colleague, Mr. Cooper, with a similar affection, in the North London Hospital: and, at present, there is a middle-aged female there studded over with hard tumours. Encysted tumours are sometimes seen on the extremities, superficially situated; and occasionally also, tumours and ulcers of a bad kind occur. These latter generally proceed from the cutaneous tissue; they may be dissected out at an early period, and also in their advanced stages, if the lymphatics appear to be unaffected; amputation of the limb may even be called for, when the disease is of great extent, but the other circumstances favorable. Some tumours of the fingers and hand will be treated of in the next chapter.

The osseous tumours of the extremities are very generally of a grave nature, commencing in the cavity of the bone, in its cancellated texture, or on its surface. Generally speaking, the tumours from the central cavity or meditullium are soft, increase rapidly, and give rise to thinning and expansion of the bone, with absorption of the earthy matter. The bone, if it have a long shaft, is apt to bend under the weight of the patient, or in consequence of muscular exertion. The onward progress of the

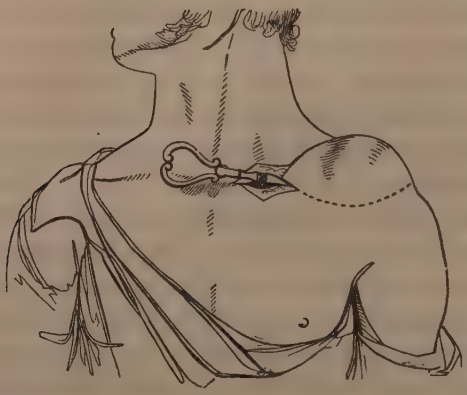
disease is thus generally much increased. The section of these growths is greasy and brain-like, often broken down and mixed with blood; but the tumours from the surface are firm, fibro-cartilaginous, or bony. The clavicle has occasionally been found involved in such diseases, and, in a few instances, the greater part of that bone has been extirpated together with the morbid growth.

A case is recorded above a hundred years ago, in which a Prussian surgeon performed this operation; and it has been repeated by Drs. Mott and Warren, in America, and by Mr. Travers in this country.

In Mr. Travers' case, the disease had apparently commenced in the medullary canal of the bone, and the morbid growth was limited by thickened periosteum. I had occasion lately to pursue the same practice in a case of a young farmer, of healthy constitution, labouring under a very large and formidable tumour of the left shoulder. He was brought to me by Mr. Garman of Bow, who deserves great credit for urging upon the attention of those who were consulted on the case, the propriety, if possible, of removing the diseased mass, which was rapidly on the increase, and which sooner or later must have destroyed the patient. The disease was attributable to a bruise on the clavicle, received in carrying hurdles. It was of fifteen months' duration, and from the first had been fixed to the bone. A variety of means had been used with the view of diminishing tho swelling; powerful friction, with preparations of iodine, &c., had produced rather an unfavorable change, inasmuch as the skin was much thickened, discoloured and firmly adherent to the surface of the subjacent mass. Sir A. Cooper and Sir Benjamin Brodie concurred in opinion that it was right to make the attempt at extirpation; and the latter gentleman very kindly and efficiently afforded his advice and assistance in the operation.

The clavicle was first of all cut down upon, the incision being made to diverge a little on each side of the tumour, towards its mesial aspect, thus The bone was partly sawn through, within three quarters of an inch of its sternal extremity,

and then clipped across by the cutting forceps. The cut end having been raised by means of an elevator, a screw (one of those found in an old trepanning case, and intended for raising depressed bone) was fixed thus in the medullary cavity. The



incisions were then carried round the base of the swelling, including a large portion of integument. The deep dissection was conducted as close as possible to the tumour and bone, which it invested completely. The muscular fibres, and the conoid and trapezoid ligaments having been cut, no difficulty was experienced in performing disarticulation of the scapular extremity. The loss of blood was very trifling, no vessel demanding ligature until the extirpation was completed, which, after all, occupied no more than seven or eight minutes. The section of the tumour presented a white firm mass, enclosing a portion of yellow fatty-looking substance. The progress of the case was so far satisfactory, the cicatrization proceeded with rapidity, and the motions and power of the limb were but little abridged. The operation was performed on the 27th of May, 1838, not a little contrary to my own conviction of the propriety of the procedure. I all along feared that the disease was one "mali moris," and doubted whether I was justified in having recourse to an operation so hazardous to life, without any certainty that the patient would enjoy an immunity from the disease. I was, however, so pressed by the patient, his friends, and medical

attendant, backed by the decided opinion of our two greatest surgical authorities, that I at last gave a reluctant consent to do my utmost to eradicate the morbid structure. My fears and anticipations turned out unfortunately to be too well founded. On the 6th of September, the patient, accompanied by Mr. Garman, called to show three large glandular tumours in the vicinity of the cicatrix. One under the pectoralis major, one on the side of the neck, the third over the superior costa of the scapula. The integument over one of these tumours sloughed soon after the patients' return to the country, a fungus was thrown out which bled most profusely; on one occasion to the extent of several quarts. He soon sank from a recurrence of the hæmorrhage. A case, in which the greater part of the scapula was removed on account of aneurysm of that bone, will be found in the "Edinburgh Medical Journal for 1819," and also in the "Elements of Surgery," 2nd edition, page 190.

Cellular exostoses seem to have their origin occasionally in the heads of bones, as hypertrophy of the original cancellous tissue, covered outwardly by a dense shell. Such hard tumours grow slowly, and may even become stationary; it is sometimes only after a long series of years—twenty, thirty, or forty—that they attain such a size as to prove intolerable. Tumour on the shaft of a bone, if not exposed to injury, may thus be submitted to for a long period; but if seated near a joint, if from excitement the growth becomes rapid, or if it be placed in such a direction as to interfere with the motions of the limb, then recourse must be had to operative procedure for its removal. Amputation of the limb offers the only, though doubtful, chance of cure; and must be undertaken at a very early period, when the tumour is soft, medullary, and of rapid growth; it is likewise the only remedy, ultimately, for the exostoses of large size, and for the fibro-cartilaginous growths.

A tumour is formed in the shaft or head of the long bones, by slow collection of fluid and expansion of the parietes: this takes place very slowly, and, after many years, the fluid may escape through the bony or membranous parietes, and come to the surface; a discharge of bloody serum, of glairy fluid, or of ill-digested pus, takes place, but without subsidence of the

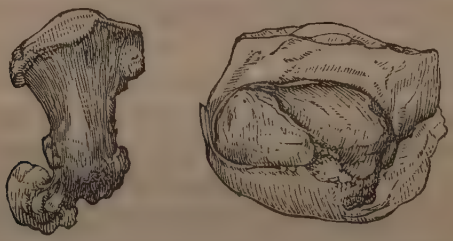
swelling. In fact, such cavities in bones, when of any size, and particularly when the shell is very thin, contract very slowly, if at all. The want of elasticity or contractility in the tissue, and its low vital power, as formerly remarked, account for the slowness, difficulty, and impossibility, in many cases, of bringing about a cure of suppurating cavities in bones. And, in such cases as the one from which this bone was obtained, amputation of the membrane must be had recourse to in order to preserve life. The operation was proposed; the poor lad, emaciated and worn to a perfect skeleton by suffering and discharge, would willingly have submitted to it; and in all probability he would have been now alive, a useful member of society. But a cruel hard-hearted female relation, on whom he was dependent, refused to permit the chance being given him, on the ground that he could not for some time support himself; asserting further, that he was better dead, than alive with the loss of one of his extremities.

Tumours occasionally form in the sheath of the nerves in the extremities. The sciatic and its branches are most frequently so diseased. The anterior crural is sometimes involved, and more than one nerve may be affected in the same individual. The nervous fibrillæ are stretched and displaced, and the parts which they supply are the seat of painful sensations or numbness. These tumours vary in structure; they consist of a cheesy or albuminous deposite in the neurilema; sometimes they are hard and fibrinous, or their section presents a brain-like and bloody mixture. In the Edinburgh Royal Infirmary I removed, from a middle-aged and healthy-looking man, a tumour which occupied the popliteal space for a considerable period; it was growing rapidly, had attained the size of a cricket-ball, and seriously impeded the motions of the limb. On pursuing the dissection, the tibial nerve was found intimately connected with the growth, the fibrillæ stretched upon its sheath, and entering into its substance; the nerve was cut across above and below, and the whole mass extirpated unbroken and entire. During his stay in the hospital, a tumour was ascertained to exist on the fore part of the same thigh; an inflammatory swelling took place there and suppurated, but after this was opened the original lump remained. Within six months after the wound in the ham had healed, the patient returned with an enormously swollen limb, and a large elastic morbid mass in the back part of it; from this a bleeding fungus was protruded, and he soon died. The original tumour, in my collection, is soft and bloody; the one from the fore part of the thigh, ovoid and larger than a hen's egg, involved the anterior crural nerve, and is apparently fibrinous; the diseased structure, which was reproduced in the popliteal space, had all the characters of fungus hæmatodes. Strange to say, the removal of the tumour from the ham, with at least three inches of the tibial nerve, was not for an instant followed by the slighest deprivation of either sensation or power of motion in the limb and foot. Amputation of the member has been resorted to when, during the dissection of a tumour, it has been found ultimately connected with a large nerve; but this step is unnecessary and unwarrantable. Tumours not of a malignant

character have been successfully taken away along with part of the sacro-ischiatic nerve.

Tumours over the ligament of the patella are by no means uncommon, and are attributable to pressure; they are caused by thickening of the superficial bursa in this situation, with accumulation in its cavity. The degree of thickening, and the nature of the contents, are various; the quantity of fluid, in cases of long standing, is often very small; in fact, a sort of encysted tumour is converted into a solid mass, by deposite of lymph which gradually becomes organised. The contents are at first thin, after bruise they are tinged with blood, and sometimes cartilaginous bodies float in the cavity. The recent cases are treated satisfactorily by hot fomentation and deobstruent plaster, confirmed and old enlargements may require to be blistered, and in extreme cases a few silk threads may be drawn through the cyst. The mode of treating abscess in this situation has been adverted to in the first chapter. When the tumour has become solid or nearly so, and has resisted all attempts to promote discussion, then it may become necessary to dissect it out; the incision must be made in the direction of the limb, and, if possible, no integument should be removed.

A tumour of the toe, here represented in both the recent and



macerated state, gives rise to great trouble and annoyance. It is covered by thin and adherent integument, displaces the nail, and grows from the bone; the attachment is sometimes by a narrow neck as in this instance, but often it is broad. It is met with in the working classes, and in young people who, having walked without shoes, have been exposed to contusions of the

part. The great toe is the common seat of these cellular exostoses, but the smaller ones are also liable to the formation. I have one specimen in which the growth is fully as large as the phalanx of the small toe from which it springs. This tumour may be extirpated by incision of the soft parts, and the use of the cutting-pliers; but the disease is apt to return. It is often necessary to take away, along with the tumour, the bone to which it is attached: this proceeding will be treated of in the next Chapter.

CHAPTER X.

AMPUTATIONS.

The operation of amputation is not so frequently had recourse to now as heretofore, and the progress of surgical information will probably render it even more rare than at present. The occasional necessity for its performance, as a means of saving life in extreme cases, has been insisted on in the Chapter on Diseases of Joints, and elsewhere in this volume.

The different steps of the process must be studied carefully, so that it may be performed dexterously, with the least possible pain and risk, and in such a manner as to restore the patient's comfort and power of exertion. The mode of forming a stump so as to cover the bone well, and protect the truncated extremities of the nerves, must be well considered, and its length is determined with reference to the contrivance which is to be substituted for the lost member.

The propriety of providing against a profuse flow of blood will naturally first engage the surgeon's attention. In the minor amputations, the flow of blood into the limb may be effectually checked, by exact compression with the hand on the principal vessel. Much less pressure is required to effect this object than is generally supposed; the assistant, however, must be perfectly cool and steady, and well acquainted with the course of the vessel. This mode of arresting hæmorrhage, during operations on the limbs, possesses considerable advantages. The pressure is not made until the instant that the incisions are commenced, and then only on one point. The limb, therefore, is not gorged

with blood; and besides, the soft parts can be much more readily carried back from the bone, than when they are confined by a circular band. When there is a scarcity of assistants, or when there is a probability of many vessels requiring ligature, and of its being therefore necessary to keep up the pressure for a considerable time, a strong spring may be used, with pads at its extremities,—one being placed in the course of the vessel, and the other on the opposite side. An assistant having the charge of the pad can preserve its position, and regulate its pressure, without having his hands cramped and fatigued.

The screw tourniquet, if properly strapped and correctly managed, may be very useful under many circumstances. The head of a roller, of suitable size, is placed over the course of the vessel as a compress, while a part of its loose extremity is carried round the limb. The instrument is then buckled on as soon as the surgeon is quite prepared to enter his knife, is screwed up tightly and quickly, but not before. The flow of blood into the limb is thus instantly checked, and the veins are not subjected to over-distension. It is inconceivable how much blood regurgitates, and also flows out from venous branches on the face of a stump, when compression is made in a slovenly and inefficient manner. So soon as the principal vessels have been tied,—and they seldom exceed three in number, the tourniquet, which has been hitherto kept tight, is immediately thrown loose, and the band and compress removed; and on the same principle, pressure made in any other way is done away with as soon as possible, so as to permit the return of blood, and prevent the confusion which arises from the veins pouring out their contents even more copiously than the arteries. Ligature of veins, as sometimes practised, is in general unnecessary, and is supposed to be attended by considerable danger.

The position of the patient and assistants and the nature and arrangement of the apparatus, must next be considered. The nature of the disease or injury, for which the larger amputations are performed, and its effect on the patient, will generally render it necessary to have him placed recumbent. In some of the operations on the upper extremity, however, the patient may be

seated in a chair, and supported by assistants. The surgeon should so place himself that he can accomplish all the objects he has in view, and complete the proceeding, without changing his position. He should be able to grasp, with his left hand, the part that is to be removed, so as to facilitate the disarticulation or sawing. The limb may be supported, and its position varied to a certain extent, by an assistant, but it should never be entirely out of the hands of the surgeon himself. An assistant stands on each side of the patient; one secures the temporary suppression of the circulation, another is prepared to hold back the soft parts, a third and fourth hand the instruments and sponges to the operator, whilst another strives to soothe and reassure the patient, and administers cordials if they be necessary. Too much care cannot be bestowed in washing the sponges, removing gritty matter from their surface, and squeezing them dry. Upon such apparently trivial, but really serious duties on the part of the assistants, much of the comfort of the patient during the operation depends. But in many situations fewer hands must suffice. The bleeding is then arrested by a tourniquet, or by some substitute for one,—as a handkerchief and bit of wood—and the instruments must be disposed on a table or chair, or on the ground, so as to be within the reach of the surgeon. In complicated and difficult operations, it is no bad plan for the surgeon, even in the midst of good and sufficient assistance, to arrange his apparatus in such a way that he can put his fingers on any instrument that he may want, instead of calling for it in the midst of his proceeding, with a chance of getting any but the right one handed to him.

The knives must always be suited to the extent of the contemplated incisions; it must be the object of the surgeon to complete these smoothly and quickly, and to make them of such a form that their edges will fall readily into contact, and be retained without pressure or stretching of the neighbouring parts. Many amputations can be best performed by cutting from the centre to the surface of the limb; in others, part of the incisions may be made with advantage from without, and completed by cutting from within; others, again, may be performed

very well throughout, by cutting from the periphery towards the bone or joint. The incisions from within outwards, be it remembered, are always performed more quickly, and with much less pain, than those in the opposite direction.

AMPUTATIONS OF THE UPPER EXTREMITY.

In amputation of the fingers, the mode of proceeding may be conveniently varied. If the hand is presented prone, and the surgeon is called upon to remove the last phalanx, the first incision is made from the surface into the articulation, the hand being held steadily by the assistant. The operator holds the phalanx to be removed firmly betwixt his thumb and forefinger, placed on the dorsal and palmar aspects. He then lays the edge of his knife over the articulation, previously a little bent, and inclines the handle downwards. The first object being to open the joint, and to separate it thoroughly by dividing the lateral ligaments, he runs the instrument quickly across from point to heel, and at the same time raises the handle; the head of the bone is thus exposed, and is turned out by changing the position of the finger and thumb, and holding the phalanx by the sides. The blade of the knife is now carried behind it, and a flap formed in a rounded shape, from the soft parts on the front of the finger. The proceeding is reversed when the hand is supine; a narrow, a sharp-pointed bistoury is pushed through the soft parts across the fore part of the articulation, the flat surface towards the bone, and by bringing it out a flap is made, of the same shape and dimension as in the former case, and sufficiently long to cover the end of the middle phalanx. The exposed articulation is then opened, and the separation completed at one stroke. It is seldom necessary to tie any vessel: but if bleeding should persist, in spite of cold cloths assiduously applied, the end of the vessel

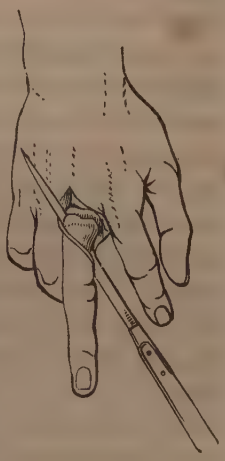
must be taken up and secured. After the oozing has entirely ceased, the flap is adjusted and retained by a narrow strip of isinglass plaster.

The same proceedings are applicable to the articulation between the middle and proximal phalanges. These bones may also be divided through their shaft, after being exposed either by circular incision and retraction of the soft parts, or by the formation of two semi-lunar flaps, either lateral or antero-posterior. The division of the bone is effected with the saw or with cutting pliers, the soft parts being protected, if necessary, by a piece of split cloth. Disarticulation is generally to be preferred, however, as affording a speedy and satisfactory cure, and being a much less painful and tedious proceeding. The dread once generally and strongly entertained of the slow adhesion of the soft parts, over a secreting surface, has been dissipated; and no surgeon now thinks of scarifying or scraping away the cartilage.

The separation of a finger from its metacarpal bone is not unfrequently required, on account of the destruction of tendons, articulations, or bones, the result of severe and neglected paronychia,—for tumours of the bones and soft parts,—or in consequence of injury, as in compound fracture, luxation, and severe laceration. In some injuries of the hand, several primary amputations of the phalanges, of the metacarpal bones, or of the joints, may be required. The propriety of saving as much as possible of any one injured finger, and, in severe injuries of the member, of avoiding by all possible means removal of the whole hand, has been insisted on in Chap. III. Even the little finger is of more use than all the mechanical contrivances, however ingenious, which can be attached to a stump of the fore-arm.

The removal of a finger at the metacarpal joint may be effected in two ways. An incision is made on the radial or ulnar side of the joint, as may be, over the prominence of the knuckle and in a semi-lunar form, the convexity being forwards. The finger having been inclined to the opposite side, and the point of the narrow bistoury entered into the joint, the capsular and lateral ligaments, as also the extensor tendon, are cut, and

the head of the bone turned out; the blade of the knife is then placed behind it, and the part is removed by the formation of a similar and corresponding flap on the opposite side. Or an incision is at once made of an oval form from the point above indicated, completely round the joint, terminating where it began; the tendons and ligaments are then cut, and the part detached. In either way, very similar flaps are formed. The end of the incision on the dorsum of the hand may be put together with a point of suture or by plaster; and the oozing having ceased, the farther apposition and retention of the surfaces are effected sufficiently by tying together the ends of the neighbouring fingers with a bit of tape or bandage. The hand is elevated, kept dry, and uncovered; and if, after a few days, discharge should appear, the parts are made clean, and the warm-water dressing applied.



The phalanges of the thumb are removed in the same way as those of the fingers; the metacarpal bone is separated from the trapezium by passing a narrow knife, longer that that used for the fingers, from the middle of the space betwixt the fore-finger and thumb, marked by the depression at the decussation of the adductor pollicis and adductor indicis, up to the articulation; the knife is moved from point to heel, and the handle inclined towards the fore-finger. Its progress is arrested by the articulation, and if the edge be then turned a little towards the ulnar side, and the thumb pressed in the opposite direction, the joint will be easily opened, and the head of the bone so loosened, that the blade of the knife can be passed behind it. A good fleshy and muscular flap, quite long and broad enough, can be formed by bringing the blade close along the bone to beyond its distal extremity. But a better mode consists in completing the incision of the soft parts, before attempting the disarticulation. If it becomes necessary to remove the right thumb, an

incision is commenced over the dorsum of the metacarpal bone, about three-fourths of an inch above the articulation; this is carried along the line of the bone, inclining but very slightly to its radial aspect, down to the fold of integument betwixt the thumb and fore-finger; here the point of the bistoury is entered, and passing under the adductor muscle, is made to emerge through the incision where it commenced. In order to effect this in a smooth and dexterous manner, the bistoury must first be held in the left hand, and, after the puncture has been made, is transferred to the right. The proceeding is exactly the same in the operation on the left thumb, except that the incisions are necessarily commenced with the right hand, and finished with the left. It may be done otherwise, but great apparent awkwardness is avoided in this and other operations, by a surgeon who can use either hand readily. These amputations of the thumb are generally demanded either on account of injury, or in consequence of disease of the bones and joints, following acute inflammatory action.

I have had occasion to remove the little finger and its entire metacarpal bone, in several instances, on account of cellular exostosis of large size, attached by a broad base. In all these operations, care must be taken so to fashion the flaps, that they shall sufficiently cover the ends of the bones, without being either too long or too short. In removing parts of the hand for tumours or ulcers of a bad or suspicious nature, the first and main object is to get thoroughly rid of the diseased and probably contaminated structure; and it may happen in doing so, that soft parts cannot be saved in sufficient quantity to cover the exposed surface completely. I had occasion, very lately, in the case alluded to at p. 319, to remove the little finger and the bone supporting it, at its articulation with the unciform bone,

on account of tumour involving the proximal phalanx, the joint, and the terminal extremity of the metacarpal bone; the flap was of necessity left scanty, and the cure was protracted eight or ten days in consequence; but without encroaching on the morbid growth, and so risking its reproduction, any greater quantity of integument and muscles could not have been saved. The growth proved to be soft and dark-coloured almost melanotic at some points. This dark appearance might perhaps be in part attributable to the punctures made at various times, for the purpose of exploration, or for evacuating collections of fluid which were supposed to exist. During the progress of the disease, grooved needles and lancets had been passed into the substance of the swelling some eight or ten times,—certainly not with the effect of either arresting its increase, or improving its disposition. It is to be feared that sufficient care is not generally bestowed in ascertaining the history and duration of cases that present themselves, and that means are not taken to acquire that necessary degree of tact, by which the nature and consistence of various swellings may be predicted with almost invariable certainty. In removing the little finger with its metacarpal bone, a sufficient flap can generally be made of integument, along with the abductor and flexor brevis muscles. It is perhaps the best plan to make the flap in the first instance, by entering the knife on the dorsal or palmar aspect over the head of the bone, and drawing it down at once to a sufficient depth along its radial margin, beyond the metacarpo-phalangeal joint: here it is turned, and the incision continued along the opposite aspect, still to the radial side of the metacarpal bone. The full fleshy flap thus formed is rapidly dissected back; the point of the bistoury having been pushed betwixt the bone to be removed and the adjoining one, is drawn at one sweep through the soft parts; and then, by turning the member to the ulnar side, separation from the unciform bone is easily effected.

After removal of the little finger, or part of the metacarpal bone together with it, it is sometimes difficult to secure the arteries by ligature. They retract into the dense tissue in the palm of the hand, and are not easily got hold of. Should

hæmorrhage continue after the operation, it will be easily arrested by plugging the wound with lint and applying a compress and bandage for twenty-four hours; the bleeding will at this time most probably have ceased, and the union of the parts will not be much retarded by their coaptation having been deferred a few hours. A necessity seldom arises for removing the whole of the metacarpal bone either of the fore, middle, or ring fingers. It is a proceeding more frequently talked of than executed on the living body. I had occasion in the following case to disarticulate two of these bones, and without premeditation. I had not forgotten the form of the articulations, and their removal was accomplished with a small dissecting knife with which I had commenced the operation, and before a proper strong bistoury could be handed to me. The case had been previously very anxiously and carefully treated by my friend Mr. Jones of Leamington, with the advice of Mr. Hodgson of Birmingham.

"T. B., aged 22, a footman, was admitted June 2, under the care of Mr. Liston.

History.—About ten months since he observed the commencement of a soft and compressible tumour on the back of his hand; the skin covering it was discoloured. The tumour was very painful for three days, at the end of which the swelling and pain almost entirely subsided. He cannot account for the origin of the tumour in any way, unless it was produced by the pressure which his hand was continually subjected to, from the leg of a chair, in carrying an invalid up and down stairs for several months. For the two months following, the tumour increased a little in size, and became hard, but was not painful. The following particulars of the after progress of the disease we gather from a letter of a gentleman under whose care the patient placed himself:—"I first saw the case on the 2d of last November, and it then presented the appearance of a common ganglion in the back of the hand; the only peculiarity belonging to it, was its not being quite so regular as these tumours generally are. However, this was then my diagnosis, and upon it I founded the treatment, commencing with pressure, and subsequently piercing the tumours, of which there were apparently three, with an acupuncture needle. This operation I repeated at intervals, but

my faith in the correctness of the real nature of the disease was shaken, because there was not, on any one occasion, the escape of a single particle of serous fluid, the tumours remaining undiminished in size, and in all respects unaffected by the puncturing. On the 9th of January, an hospital surgeon being accidentally in our town, I requested him to give me his opinion; he at once pronounced it a thickened bursa, and recommended me to pass half a dozen threads of silk through it to excite adhesive inflammation. I was still doubtful of the nature of the case, and dwelt particularly on the fact of the serous exudation being absent. He, however, said it could be nothing else, and under his authority I followed his direction and made the seton; considerable excitement followed, and in forty-eight hours suppuration had set in, so as to set the silk completely at liberty; I therefore removed it. On the 17th, the upper opening made by the silk enlarged to the extent of a split bean, and a bloody-looking fungus was visible; this rapidly increased, raising up and causing ulceration in the integuments on the back of the hand. I had then recourse to various remedies, and succeeded in keeping the fungus in subjection till the 27th of February, when I felt satisfied that something more must be done, and I sent the patient to the surgeon who recommended the use of the seton. The fungus was then divided into three irregular portions; the largest about the size of a pigeon's egg, and the other two somewhat smaller; and the advice given was, that the radial and ulnar arteries should be successively tied, and the parts kept constantly cold with a solution of alum. This advice I acted on, and tied the radial on the 1st of March, and the ulnar on the 14th. The effect on the fungus was most gratifying, and I began to think that the disease would be unable to perpetuate itself, having lost so much of its support. In order to get rid of the fungus, however, I was obliged to have recourse to the potassa fusa; anything short of this seemed comparatively ineffectual; by the aid of this powerful caustic I succeeded, about six weeks ago, in bringing down the fungus to a level with the integuments. Since then, finding a small muscular branch in the back of the wrist, carrying on a considerable circulation, I divided it; and, to my great annoyance, I now

find a branch parallel to, and in continuation of, the radial artery, again becoming evident, although it had been as perfectly quieted by the ligature, and as securely tied, as any investure that can take place. I have now brought up the case till within a short period of the present day, and I am now applying the chloride of zinc with carbonate of lime, which I find a good escharotic, but still the germs of the disease remain.

"The sore is now below the level of the surrounding skin, extending over the whole of the back of the hand, and covering almost entirely the four metacarpal bones of the fingers; in the centre, the surface of the ulcer is irregular, and covered with a thick, dirty discharge; the skin at the edges is red, thickened, and elevated.

"Water-dressing: the general health to be attended to.

"4. To-day Mr. Liston operated for the removal of the tumour. He carefully dissected it from the extensor tendons; but finding, during this process, that the metacarpal bones of the second and third fingers were soft and pulpy, involved in, and firmly attached to, the diseased growths, he determined to remove these two bones, with the fingers, at the carpal articulation. This was speedily effected; the whole mass was removed, and the palm left entire. There was a good deal of hæmorrhage, and several vessels required ligature.

"6. The wound is granulating kindly.

"18. Has been going on well since our last report; he will have a compartively useful hand."—Lancet, vol. ii. 1837–38, p. 491.

The wound is now (July 9) all but healed, and everything seems to promise a permanent cure. August 19, 1840. The patient remains free from disease, with a very useful hand.

The case was a very puzzling and difficult one to manage, and on the spur of the moment I had to choose betwixt removal of the whole hand, and an attempt to extirpate the affected bones. For by the previous history I had been led to suppose that the disease was confined to the soft parts, and it was only after having pursued the dissection so far, that the true nature of the malady was discovered. The middle metacarpal bone was found to be soft, and to have thrown up spiculæ into the

fungous ulcer: and that of the ring-finger was surrounded by morbid structure. It is not improbable that the mischief had originally sprung from the medullary canal of the former bone; for, on making a section of it, its walls, expanded and thinned, were found to contain a quantity of soft and bloody substance.

Cases not unfrequently present themselves, in which the distal extremity of one of these bones being involved with the articulating apparatus in disease, it becomes proper to remove part of that bone along with the finger. Incisions similar to those for removal of the finger at the the first joint, by the oval method, are made to pass beyond the head of the bone; and after the flexor and extensor tendons have been cut, the bone is divided by the application of a small narrow saw, either without or with a back, or by the use of cutting forceps. In using the forceps, the flat side is applied towards the trunk, so that the surface which is left may be perfectly smooth. One very great advantage gained by employing the forceps is, that the palm can be left entire, the hand is thus much less deformed, the palmar arch is in general not interfered with, and the hæmorrhage is accordingly much less. It is astonishing how readily the bones can be cut asunder with this instrument, without the least splintering. The approximation and retention of the adjoining fingers, and water-dressing, complete the after treatment. But care should be taken not to bring the fingers too closely together.

When the whole hand is involved in serious and incurable disease,—as but rarely happens,—or when the metacarpal bones of the fingers and thumb are reduced to a confused pulp of lacerated soft parts and comminuted bones, as by entanglement in the cog-wheels of machinery, the surgeon must choose between amputating at the wrist-joint, and at the middle of the fore-arm. In the only case in which I have practised the operation at the joint, on the living body, I left a very useful stump. The machine-makers say that the extremity, thus left, is too long, when their apparatus is applied; this may look somewhat awkward; but it is an advantage, to a working man, to be able "to make a long arm," and possess the full rotatory motion of the limb.

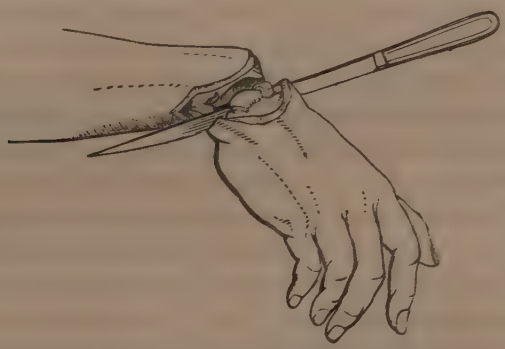
I have had occasion to practise the operation a second time since the first edition of this work appeared. The patient was

received into the North London Hospital, in consequence of his hand having got entangled under a very heavy mill-stone, which revolves on its edge, and is used, it appears, for grinding drugs. The hand was crushed to atoms, and the articulation betwixt the two rows of the carpal bones opened. The stone had run up along the fore-arm: and there was great bruising and separation of the integument, with extensive and bloody effusion into the cellular tissue of even the upper-arm, half way towards the shoulder. There was some abrasion of the surface, but no opening into the bloody collection. It was barely possible to save sufficient skin to cover the ends of the radius and ulna, and I preferred giving the patient the chance of a good long stump, rather than to cut in the midst of the bruised parts, and into a bag of blood. For a few days the appearance was promising, and speedy absorption of the effused fluids was expected. But notwithstanding all precautions, pain and swelling supervened; and in order to prevent extensive destruction of the skin, several free incisions were required in the fore-arm, and even above the elbow. The stump healed kindly, and the swelling of the limb rapidly decreased. The dread that the cure may be retarded by slow union of the integument over the synovial membrane and cartilaginous coverings of the bones, is, as formerly remarked, utterly groundless. It is a good rule in amputating, on account of injury, to make the incisions wide of the bruised parts, in order to avoid the risk of an unhealthy stump. This rule was not so much departed from in the above case as might be supposed. There was one comparatively uninjured point betwixt the lacerated parts and the bruise, and this was not unhappily fixed upon for the incisions, instead of the arm near the shoulder-joint.

The operation is most conveniently and readily performed, by making an incision of a semi-lunar form, with a small amputating knife, through the integument over the second range of carpal bones. This flap is pulled back, and the joint opened; the lateral ligaments and tendons on the radial and ulnar sides are divided, and a second flap, a little longer and more full, is formed, by bringing the knife out in the palm. The knives, which I use in almost all the greater amputations, are straight-backed,

thin near the point, and slightly convex on the edge,—as will be seen by reference to the illustrations. In making this latter incision, it must be remembered that the integuments covering the pisiform bone are extremely thin; and if sufficient care be not taken, a button-hole is very easily made in the skin.

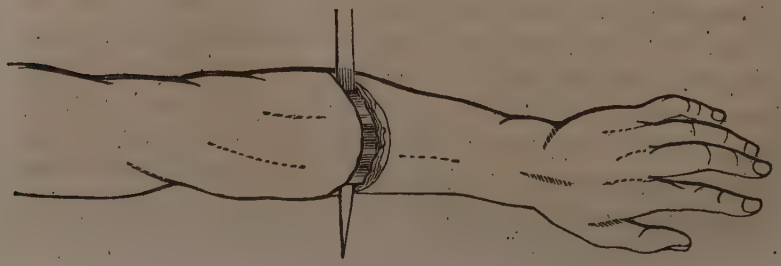
The radial, ulnar, and perhaps the interosseous arteries are tied, the parts are brought together by one point of suture at the apex of the flaps, cold cloths are applied for some hours, and the edges then neatly approximated, and retained in close



contact by narrow slips of the proper plaster. A tourniquet can never be wanted in any operation on the upper extremity, unless no assistance whatever can be procured; and there is no occasion for bandage, compress, or pledget. These are certainly superfluous and hurtful, after this, as after other amputations well performed. The suture is removed on the first or second day; and if the wound should open at all, simple dressing can be applied; by which is meant not a compound of grease and filth, often rancid, with some drying earth, as it is called,—but tepid water with lint, retained by oiled silk, and followed in due time by some slightly astringent lotion, if such be required.

Amputation of the fore-arm should not be attempted below its middle, otherwise a good covering cannot be had for the ends of the bones. It is demanded in consequence of either severe injury or disease of the wrist-joint. In amputating, in the former case, the limb should be grasped above the wrist, and extension made so as to put the muscles on the stretch, that they may be divided

evenly. If this be not attended to, one set is cut whilst somewhat stretched, the others when relaxed, and a very uneven and ragged stump will be formed in consequence. The limb is placed in a middle state betwixt pronation and supination; the surgeon takes hold of the lower part with his left hand, whilst an assistant puts the integument on the stretch above: the posterior flap had better be made by cutting from without towards the bones, the horns of the semi-lunar incision being made to project well upon the palmar aspect; transfixion is then made, without raising the knife from the part, by passing the blade under the flexor muscles, close to the bones, from the termination to the point of commencement of the first flap. In operating upon the left arm, the first incision is commenced on the radial side; upon the right arm, on the ulnar side. The flap having been completed and held back, the interosseous substance is divided, and the bones sawn together. In doing so, there is no necessity for changing the position of the limb. The part to be removed is not heavy, and can easily be supported in the left hand of the surgeon; and there is no risk of the bones snapping and splintering, if ordinary care be taken. In using the saw, the part to be removed is very slightly depressed, so that the instrument may not be locked. If this be attended to, if the saw be in good order,—quite straight on the edge, with its teeth sharp and well set,—and if it be used with a light hand,—the division of the bones will be completed smoothly and quickly. No retractor is required in this operation; the ligature of vessels, which will be easily found on the anterior flap, and the dressing, both primary and secondary, are the same as already described and recommended for recent wounds in general. In the wood-cut the operation is shown as about half completed.



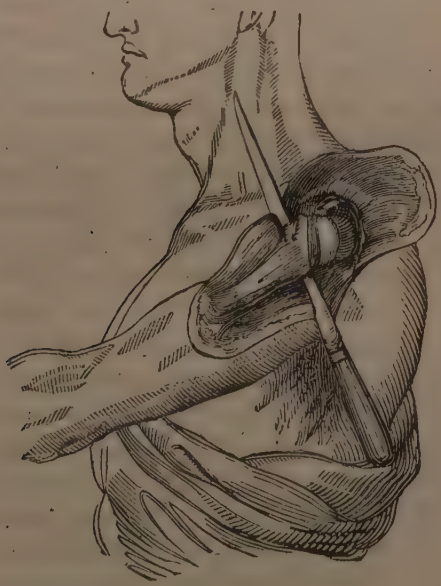
In some cases of injury, involving a great part of the fore-arm, amputation may be performed with advantage at the elbow-joint. The surgeon will be guided in his preference of this to the operation on the upper-arm, by the state of the soft parts on the anterior aspect of the joint, and the possibility of saving sound skin and muscle to cover the end of the bone. I have performed the operation more than once on the living body, and should be disposed to repeat it in favorable cases. One flap is formed by transfixion, the blade of the knife being made to pass under the bellies of the supinators and flexors, close to the fore-part of the articulation,—from the ulnar aspect in the right extremity, from the radial in the left; a fleshy semi-lunar flap is thus formed by cutting downwards and to the surface. Feeling for the outer condyle,—in the one case with the fore-finger, in the other with the thumb,—the knife is passed round behind betwixt the head of the radius and humerus so as to penetrate the articulation; the fore-part of the joint is opened, and the internal lateral ligament cut; the olecranon process may then be either sawn across or disarticulated, according to the choice of the surgeon.

The amputation of the upper-arm, when performed for disease of some standing, is perhaps as simple and easy of accomplishment as any operation in the whole range of surgery. Anterior and posterior flaps are formed by transfixing the limb close to the bone; the object is to form both flaps as nearly as possible of the same length and dimensions, in every way; the anterior is to be made first, and with this view the point of the knife is entered on either the inner or outer aspect; it is then pushed down to the bone, turned round its front surface, and the transfixion completed, leaving the vessels and nerves on the posterior part. By cutting downwards, and to the surface at the same time, a round and neat flap is produced. The knife is then promptly entered on the other aspect of the bone through the same incision, about an inch lower than the point of transfixion, and a similar and corresponding flap forthwith cut out. These are retracted powerfully by an assistant, the first having been merely raised until the other was completed; the knife is made to revolve round the bone, so as to cut the muscles and

clear a space for the application of the saw; the surgeon is so placed that he holds and commands the bone during the process of sawing, the fore-arm being supported by an assistant; and to guard still further against accident, it is well to work the saw directed perpendicularly. The length of the stump will depend upon the state of the parts; it may be possible to saw the bone considerably below its middle, or the division of it may require to be made close to its neck. The muscular covering, in the latter case, instead of being furnished by the triceps and biceps, consists principally of the deltoid and other muscles of the shoulder. It is sometimes practicable to divide the humerus close to or at its neck, in cases where the limb has been severely injured, near to the joint. In scrofulous diseases also involving the elbow and soft parts of the upper arm, this proceeding may be advisable. It can never, by any sensible or conscientious surgeon, be thought of in tumours involving the humerus. The recommendation of the plan of sawing the bone at its neck is, that the shoulder is there less full, and that there is less consequent deformity. The employment of a light cap made of leather, with some padding, and a little ingenuity on the part of the tailor will put all right, however high the limb may have been amputated.

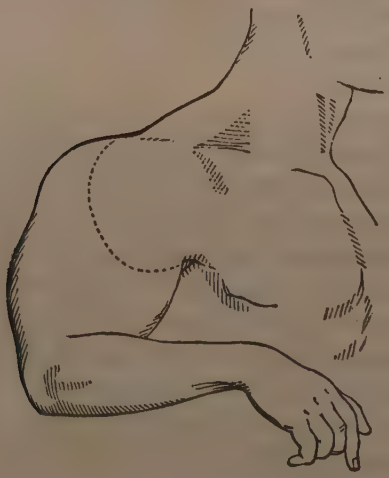
On account of extensive laceration, compound fracture, or tumour of the os humeri, it may become indispensable to remove the extremity at the shoulder-joint. This operation will require to be varied according to the nature of the particular case. The covering for the exposed part of the scapula may be obtained from one or both sides, or from the external aspect. It may be formed of the deltoid in a great measure, and in one mass, or it may consist of muscular substance from the front and behind, of part of the former muscle of the pectoralis and latissimus dorsi, proportioned as may best suit the circumstances. Occasionally, as I have found in several cases, very little covering can be obtained. The incisions may either be made by transfixing and cutting both flaps from within outwards; or, one flap having been made by cutting from the surface upon the joint, the disarticulation is effected, and the incision of the remaining soft parts completed, from within. In performing this operation for injury,

or for disease which does not encroach greatly on the joint, when the surgeon has his choice as to the form of the incisions and flaps, he cannot do better than make two of nearly equal size, and form the posterior one first. The patient is most conveniently placed in a chair, supported by a sheet of jack-towel passed under the scapula; and held by a steady assistant; the assisting surgeon compresses the subclavian artery as it crosses the first rib, in the space above the clavicle, or with his thumb, or with a boot-hook or key wrapped round with a piece of roller or wash-leather; an assistant is ready to hold back the flaps, and to directly arrest the hæmorrhage, by his hands and the application of ligatures. For this amputation, a knife of very considerable length is used: the one represented below is rather short for the purpose. In the right extremity, it is passed from the anterior margin of the deltoid, about an inch below the acromion process, across the outer aspect of the capsular ligament, until its point appears within the posterior border of the axilla; and, by drawing the instrument towards him, the operator makes quickly a full and rounded flap. The origins of the triceps and biceps, with the insertion of the infra and supra



spinatus, are then cut through, and the joint is fully exposed and opened by one sweep of the instrument; the arm having been carried across the chest, the blade of the knife is passed behind the head of the bone, and carried close to it, as shown in the wood-cut; an assistant follows the back of the instrument with his fingers, and grasps the soft parts, while the inner flap is being safely completed. The first flap is made on the left shoulder, by reversing the direction of the knife in transfixion; the point is introduced within the posterior border of the axilla, and brought out at the anterior margin of the deltoid; the rest of the proceeding is essentially the same as in the former case. The limb having been removed, the axillary, with its bleeding branches, is secured. In this and similar operations, two or three pairs of the spring-forceps will be found most useful. The wound is lightly dressed at the proper time.

In such a case as the one represented at the bottom of this page, it will be found more convenient to make the first incision from the surface. In fact, the formation of a flap by transfixion would have been here absolutely impracticable. The disease, a bony and cartilaginous tumour, twenty-two inches in circumference, had been in progress for nearly forty years, and had encroached upon the joint, so as to impede its motions, latterly



causing dreadful suffering by its pressure upon the nerves, and upon the parietes of the chest. The patient, himself a surgeon, was, from continued suffering and want of rest, at length driven to submit to its removal. I was very ably and kindly assisted by Sir Richard Dobson, the surgeon-in-chief of Greenwich Hospital, by Mr. Quain, Dr. Domville, and Mr. Busk. The outer flap was made by drawing the knife from the margin of the

latissimus dorsi to below the fore part of the acromion, and down to the joint; the immense tumour was then turned out by a stroke or two of the knife, and an anterior flap formed, as shown by the dotted line. The vessel, admirably commanded by Sir Richard, was compressed still further by an assistant, as recommended above; after it was tied, a mass of glands, which had adhered to the apex of the tumour, was dissected out from the sheath of the vessels, and from amongst the nerves; six or seven arterial branches, were tied; the patient, who bore the

proceeding with the utmost fortitude and without a murmur, having been then removed to a couch, the wound was brought together in an even line, without the least strain, by a few points of suture. Considering the displacement of surrounding parts by the diseased mass,—shown here with the nerves stretched over it,—it was fortunate that so just a proportioning of the flaps should have been observed.

AMPUTATIONS OF THE LOWER EXTREMITY.

The phalanges of the toes are removed, when necessary, by the same proceeding as recommended in treating of the similar joints in the upper extremity. It is to be recollected, however, that the metatarso-phalangeal articulation of the small toes is deeply situated in the ball of the foot, and that the incision, in making the flaps, must reach this before the point of the knife is used to divide the capsule, ligaments, and tendons; it is with the point and not the blade of the bistoury that this is to be effected, otherwise the integument will be cut across, and notched in a very awkward manner. The cases in which it may be deemed proper to remove part of the toes, are, injury, intractable disease commencing in the soft parts, onychia, of a bad kind, involving the matrix of the nail and phalanx, disease of the joints, and bony tumour.

Disease is often situated in the articulation of the proximal phalanx, more especially of the great toe, which is not to be wondered at, considering its exposed situation, and its liability, from the immense strain and weight thrown upon it, to be wrenched and twisted; on that account, it is often necessary to remove part of the metatarsal bone along with the toe. In many cases the bone is thoroughly diseased: it is hollowed by abscess, sometimes commencing originally in its substance; and it is often partially necrosed. The articulation betwixt it and the internal cuneiform bone is also occasionally involved, but this is a rare occurrence. Removal of the whole bone along with the toe is often demanded, and I have had occasion more than once to remove the internal cuneiform at the same time. The most effectual, quick, and least painful mode of getting at the bone to cut it across, and of exposing the articulations, in order to divide

their attachments, is to form a flap similar to that recommended for removal of the little finger. If the disease be confined to the distal end of the metatarsal bone, the incision should commence or terminate—according to the position of the surgeon, the foot he has to treat, and the facility he may possess of using equally either hand—on the dorsum of the foot, over the proximal end of the bone, and rather to its fibular aspect; if so commenced, a sufficiently ample and long flap is formed by turning the knife round, beyond the diseased joint, into the plantar aspect, and extending the incision to the point opposite where it commenced.

The flap, which may perhaps include, and be perforated by, several openings, is reverted by a stroke or two of the bistoury, which should be stronger than that used for ordinary purposes, broad, and of considerable length; the instrument is then passed betwixt the toes, and made to cut outwards: all the soft parts are divided, and the bone is forthwith sawn or clipped across about its middle,—or towards its head, if the disease be extensive, as in the annexed sketch. Here is an ulcerated

cavity of long standing in the situation of the joint, which is anchylosed, containing a sequestrum of the cancellated texture. The shaft of the bone was cut across with the forceps, and its head left. Owing to some cause or other, troublesome secondary hæmorrhage occurred from the anterior tibial; and, several days after the removal of the toe, it was found necessary to raise the flap, and turn out the remaining portion of bone, in order to reach the vessel; the head of the bone, with its smooth section, was thus obtained.

It is a great object to save the head of the bone, as it gives attachment to one powerful muscle, and to part of another; but this is very often impossible, and, notwithstanding its removal, the foot soon becomes strong and serviceable, the tendons forming new and firm connexions. When removal of the whole bone is determined upon, the flap, of the same form, should be detached further towards its base; the toe, detached from the adjoining one, as in the operation already described, is then pushed forcibly to the tibial side, and the ligaments divided, if the nature of the disease will permit; but the bone is sometimes so acted upon by the absorbents that it will scarcely bear handling. The bleeding is stayed during the operation by pressure on the anterior tibial, as it lies exposed on the dorsum of the foot; its cut end having been tied, cold water is applied, and the flap in due time is put in its place, held by a point or two of suture, and the edges are put into close contact by plaster. In the greater number of cases only partial union can be looked for, and the discharge must continue for some considerable time.

Some of the smaller toes, and even all, may be taken away along with the bones supporting them, leaving only the great toe, and the most powerful part of the arch of the foot. The incisions must be fashioned according to the nature and extent of the injury or disease for which the operation is undertaken, the form and site of the articulations being at the same time attended to.

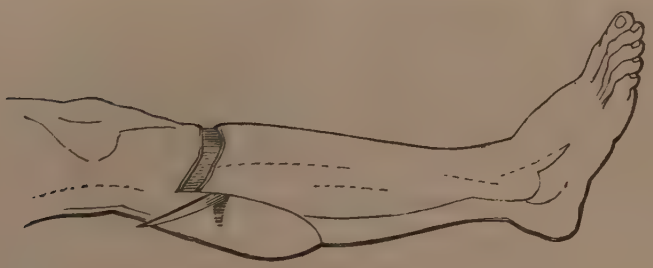
Circumstances sometimes arise to render removal of all the toes, with their metatarsal bones, advisable. An incision is generally made across the dorsum of the foot, from the tarsal

end of the metatarsal bone of the great toe to that supporting the little one, or the proceeding may be reversed; disarticulation having been effected, the knife is placed behind the head of the bones, and a flap of sufficient length is procured from the sole of the foot. But the formation of this flap in the first instance renders the disarticulation more easy, and simplifies the whole operative proceeding. A large bistoury is preferable to the catline or small amputating knife generally used. A rounded flap is made by cutting from the tibial to the fibular side, or *vice versa*, close to the roots of the toes; it is turned back, and the two points, the commencement and termination of the first cut, are united by another incision carried across the dorsum in a semi-circular form, and somewhat beyond the articulations to be opened; the integument is pulled back, the cellular connexions being cut so as to permit full retraction; the disarticulation is then completed with facility, the bones being forcibly bent towards the plantar aspect, more especially during division of the ligaments which bind the head of the second metatarsal bone. The saw has been applied, as by Mr. Hey, to divide this and the other bones, but disarticulation is very easily effected as recommended; and the surface left is sufficiently even, and well disposed to heal. In a similar way a shorter stump may be formed in this situation, the separation being effected betwixt the connexions of the navicular and cuboid with the astragalus and os calcis respectively. The vessels are tied, and the wound managed in the usual way.

Amputation of the leg is performed at one of two points, according to the circumstances of the patient, the bones being sawn either about mid-way betwixt the knee and ankle, or close to their upper ends. If the patient have not any laborious employment to follow, wishes to conceal the deficiency, and can afford to purchase an artificial foot, then the stump should be left sufficiently long for the attachment of this, so that the motions of the knee may be preserved, and the gait rendered less awkward. When, however, the patient is otherwise situated, the shorter the stump, the better and more serviceable will the limb be. There can be no greater mistake than to leave a working man with a long stump below the knee; it is continu-

ally in the way, and I have very often indeed been induced to comply with the request of patients to have their stumps shortened, and made of a more convenient length. Unfortunately, other reasons, besides the inconvenience of mere length, can be frequently urged to induce the surgeon to comply. The soft parts and bones not having been well proportioned, the cicatrix, if completed, is tender and liable to ulceration; the ends of the nerves, naturally bulbous where truncated, are exposed, and entangled either in the scar, or with the end of the bone; and the patient is thereby kept in a constant state of agony. This must be the case very often, so long as the old, round-about, tedious, painful, and imperfect operation continues to be practised; it is true that, in some situations, a good operator can make a very fair and good stump by the circular method, but it is, generally speaking, attended with much more suffering, and the results are not by any means so satisfactory. A surgeon must take great pains, and deserves great credit if he succeed, in making a tolerable stump, more especially where there are two bones, by any other than the mode by flaps; he may cover the bones certainly, but only by integument, separated by a painful process from its connexions, and slow therefore in contracting new ones. Under some circumstances it may be either impossible, or unadvisable, to save muscle. It may be unsound, lacerated, or overmuch developed. The ends of the bones, when sawn high, are not exposed to pressure, and then there is less occasion for a muscular cushion. A sort of anterior flap should be made below the knee, but it is short and thin; the principal covering is obtained from behind, and the incisions must be so contrived that the edges and surfaces shall correspond. A proper fleshy cushion cannot be got lower than the middle of the leg; if the bones are to be sawn there, the surgeon will place himself so as to hold the limb with his left hand, below the part at which the division is to be effected; provision is made for the suppression of bleeding, and the sound limb is fixed by a handkerchief to the foot of the table; an assistant supports the affected foot, another puts the integument above on the stretch, and is ready to hold back the parts during the incisions, and after they have been completed. When the right

limb is the subject of operation, the point of the knife having been entered on the outside, behind the fibula, is drawn upwards along the posterior border of that bone, with a gentle sawing motion, for about a couple of inches; the direction of the incision is then changed, the knife being drawn across the fore-part of the limb, in a slightly curved direction, the convexity pointing towards the foot; this incision terminates on the inner side of the limb, and from this point the knife is pushed behind the bones, and made to emerge near the top of the first

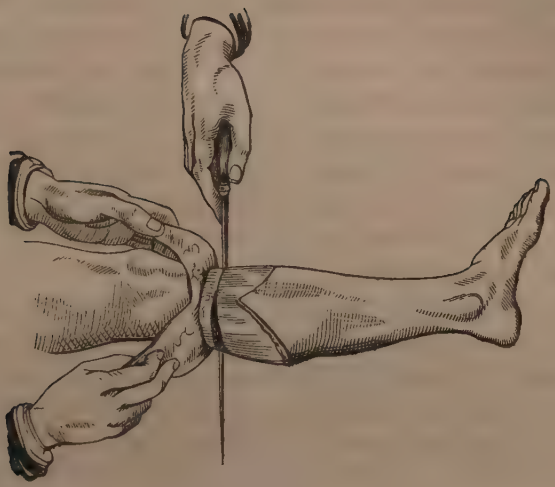


incision; the flap is then completed, as here shown by the dotted line. All this is done smoothly and continuously, without once raising the knife from the limb. The inter-osseous, muscular, and ligamentous substances are cut; the anterior flap is drawn back, and its cellular connexions slightly divided; both are held out of the way by the hands of the assistant, and the separation completed with the saw. By proceeding thus, all risk is avoided of entangling the knife with the bones, or betwixt them. In dealing with the left limb, the proceeding is very similar: the internal incision is not made quite so long; but it should still be practised, for a longitudinal opening of about an inch or more in extent is more easily found in the transfixion, than the mere point at which the anterior incision is commenced. In sawing the bones of the left leg, the tibia may safely be cut first, as the surgeon commands the limb during the process, and can easily obviate the risk of snapping the fibula. The awkwardness attendant upon a change of position is thus avoided. Disarticulation of the fibula is not advisable, owing

to the connexion of its head with the bursæ and knee-joint. It is seldom necessary to round off the spine of the tibia.

Amputation close to the joint is performed precisely in the same manner; the incisions being made so that the fibula is exposed and sawn immediately below its head, the tibia close to the tuberosity. One great advantage attending this amputation is the shortness of the stump; the patient, resting on the knee, can cover both his wooden support and stump with his trousers. Another immediate advantage is the facility and rapidity with which the whole proceeding can be executed. In very many cases, I have managed so as to tie one vessel only,—the popliteal,—and this materially shortens perhaps the most painful part of the whole process. The form of the flap, and the relative position of the popliteal artery, with its accompanying vein and nerve in the high amputation, is shown in the preceding sketch.

The flap amputation may occasionlly require to be modified. When muscular plethoric subjects meet with sudden and severe accidents which demand immediate amputation, the large quantity of muscle which is necessarily left in the flap is liable to suppurate, to retard very much the patient's recovery, and sometimes to produce dangerous consequences. In such cases, I have performed the following operation below the knee. Supposing the left leg to be injured, with a common amputating knife an anterior semi-lunar incision is made through the skin, commencing from the inner side of the tibia, about four fingers' breadth below its superior extremity, and passing over its anterior aspect. A similar semi-lunar incision is made at the posterior part of the leg, its extremities joining the horns of the pre-



vious incision. The integument is then reflected upwards to a sufficient extent to cover the bones, and the operation finished after the manner of the circular amputation. In fact, this operation differs from the circular only in the form of the incision through the integuments. By reference to the preceding sketch, this will be easily understood.

In amputation of the thigh, the bone should not be sawn very much lower than its middle, for a long stump here is equally inconvenient to a person in any walk of life, as is a long stump below the knee to an active working man. A box sufficient to receive the stump cannot be made when it is very long; and when an artificial limb is desired, the knee-joint must be placed lower than natural, and the substitute made longer than the original. In amputating near the joint, at the commencement of my surgical career, from not attending to the circumstances above stated, I was in the habit of performing Vermale's operation by lateral flaps.

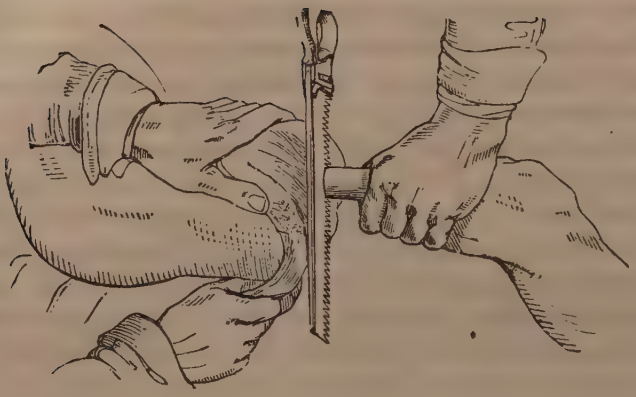
In amputation at the point of election, or higher, it will be found better, in all respects, to adopt the operation, which I introduced many years ago, by anterior and posterior flaps; and I believe I may also lay claim to the credit of introducing more

generally the mode of amputating, in all situations, by flaps formed principally by transfixion of the members. By the formation of the flaps from the flexor and extensor muscles of the thigh, a better covering can be made for the end of the bone; it remains more deeply imbedded in whatever position the limb is placed afterwards; generally, it is bent on the pelvis, and perseveringly kept there, more especially in children, some of the antagonists to the psoas and iliacus being incapacitated from acting. Whereas, if the flaps here are made laterally, the end of the bone is very apt to appear at the upper angle of the incision. Amputation of the thigh at its middle may be required on account of violent injury, as bad compound fracture of the leg, as represented below—one of the many dreadful lacerations brought from the Great Northern Railway to the Hospital—on account of luxation of the knee

with laceration, spreading traumatic gangrene, disunited fracture with wasting discharge, incurable disease of joints and bones, or tumour involving these. The necessary preparations are thus made. A table of convenient height is covered with folded blankets, or a thin mattrass: in private practice, the patient, if suffering much from motion, may be merely turned round in bed so as to make the limb project over its edge. The assistant is placed to compress the vessel, or a tourniquet is in readiness properly strapped; the sound limb is held out of the way, or what is better in all amputations of the lower ex-

tremity, it is secured by a towel or handkerchief to the foot of the table. A dresser or pupil supports the limb to be removed, and others are ready to hand instruments, sponges, ligatures, or whatever may be required. The instruments should be previously laid out on a tray, and covered with a cloth. They consist of a long, narrow, blunt-backed, and sharp-pointed knife; a plain, good, and serviceable saw; a pair of dissecting forceps, and a pair or two with a catch; also a pair of bone-nippers, in case there should be any splintering of the bone, but it is the operator's fault if this happen. The surgeon places himself on the tibial side of the right limb, on the fibular side of the left; and, everything being ready, he lays hold of the soft parts on the anterior aspect of the bone, lifts them from it, enters the point of his knife behind the vena saphena, in operating on the right side, passes it horizontally through to the bone, carries it closely over its fore part, and brings out the point on the outward side of the limb, as low as possible: then by a gentle and quick motion of the blade, a round anterior flap is completed. The instrument is again entered on the inner side, a little below the top of the first incision, passed behind the bone, brought out at the wound

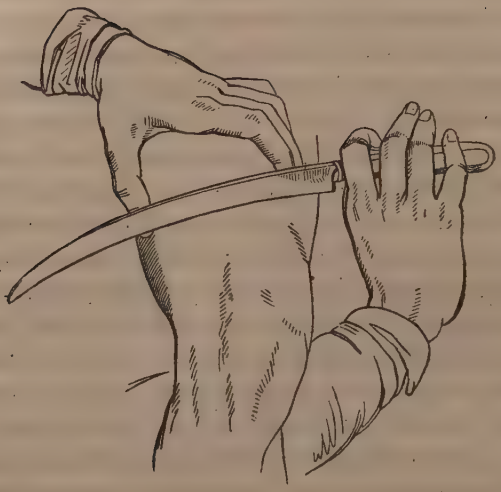
on the outside, and directed so as to make a posterior flap, in the direction of the dotted line, a very little longer than the former. The anterior flap is merely lifted up after it is formed; but now that both have been made, they are drawn well and forcibly back, whilst the surgeon sweeps the knife round the bone, so as to divide smoothly the muscles by which



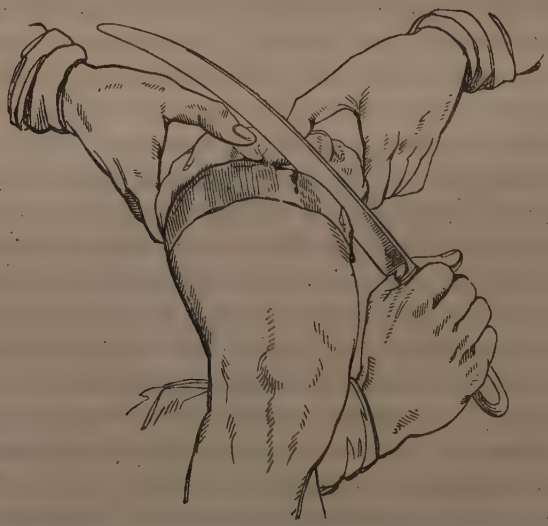
it is immediately invested. The bone, grasped by the left hand, is sawn close to the soft parts, the saw being directed perpendicularly. The femoral artery will be found on the posterior flap, is tied along with the other vessels, and the stump is treated as recommended after the other amputations. Great care must be taken, during the securing of the vessels, and in steadying the bone for that purpose, not to injure the medullary web; to this cause may often be attributed inflammation and consequent necrosis. The proceeding is, in all respects, the same on the left limb, only the incisions are commenced from the outer side. After the lapse of six or eight days, or sometimes earlier, a roller should be applied and made to embrace the whole face of the stump, in order to cause reduction of any œdematous swelling that may remain, and bring the parts into a good form. This is the only interference with the part after the first dressing, and is unattended with pain. It is very different as regards the consequences, both immediate and remote, from the old practice of pulling off day after day, and every day, loads of dressing, soaking and sponging away the effused discharges, and re-applying bandages and pledgets, amidst the screams and groans of the patient, caused by suffering much greater even than that of the operation itself. When the light and easy mode of dressing is followed, the fever and discharge are but trifling, and the period of recovery is very considerably abridged.

By forming flaps from the anterior and posterior aspects of the limb, the bone may be exposed and sawn at the inner trochanter, or it may be removed at the joint. In making the incisions thus high, the common femoral is compressed, as it passes over the brim of the pelvis; and an assistant must follow the knife with his hand, and grasp firmly the interior flap, whilst others are ready to compress the vessels in the posterior, so soon as the sawing or disarticulation is completed. These operations must be undertaken with determination and completed rapidly, in order that dangerous effusion of blood may be prevented; they are not to be attempted without great consideration, and only under very pressing circumstances. This mode of getting at the head and neck of the bone is much preferable to that usually followed, and is in every respect safer, as I have more than once ascertained from actual practice on the living body. The fore part of the articulation is fully exposed immediately on the anterior flap being formed. The capsular ligament is cut by drawing the knife across determinedly, as if it were the intention of the operator to cut off the head of the bone. The round ligament and the posterior portion of the capsule are cut, and the blade of the instrument having been passed behind the neck and trochanters, the posterior flap is quickly formed so as to allow the limb to drop. The vessels on the posterior aspect are first tried; then the femoral and those in the anterior flap, which had been commanded by the assistant, are uncovered one by one, and secured.

The circular mode of amputation is still preferred by many good surgeons, and, if carefully set about, a fair enough stump may be thus sometimes made. The time, however, required for its performance is considerably greater, and the pain is necessarily more severe and unbearable. When it is determined to amputate by incisions made from the surface towards the bone, the integument must be kept well on the stretch. The knife as here represented is carried under the limb, and laid on its interior aspect. It is then brought quickly round with a gentle pressure so as to divide the integument and subjacent cellular tissue only. By forcible retraction made by the hands of an assistant, whilst the filamentous attachments to the fascia are



separated, a large space is afforded between the divided edges. Occasionally, however, it is considered necessary to dissect the integument more extensively, either with a scalpel or with the point of the amputating knife, and to turn it back as seen here.



The blade of the knife near its heel is then put upon the fascia, and by a determined and bold incision the superficial muscles are cut. These contracting, a second and circular cut lays bare the bone. The object is, by this application of the knife and by the direction of its edge, to form a sort of hollow cone, the cut end of the bone forming its apex. With the view of dividing the bone readily and sufficiently high, in this mode of operating it is generally found necessary, for the protection of the soft parts, to use a retractor of cloth or leather. The wound ought to be treated in the simple manner already directed; it is occasionally bandaged and compressed as of old.

It has been objected to the flap operation, that secondary hæmorrhage is more apt to occur, in consequence, say its opponents, of the arteries being cut obliquely. This is not so. The principal vessels are cut transversely, and they can all be tied as securely as after any other operation. Again, it is said that the cut surface is by much more extensive after the flap, than after the circular amputation. In the Elements of Surgery, pp. 770, 771, I have shown the fallacy of this averment, and made it plain by diagrams that in the first case there are two triangular surfaces smoothly cut, and without separation of one tissue from another. In the second, a large, hollow, and often very ragged cone is left, with great derangement and disturbance of parts.

One other mutilation, sometimes rendered absolutely necessary on account of intractable and malignant disease, remains to be considered: this is removal of the male organ. It must be done in sound parts, and at as early a stage as possible, before the lymphatic system has been contaminated. There is no necessity for saving integument; on the contrary, it is an object to take away a good portion, as, during the cicatrization it might be drawn over the surface, so as to obstruct the cut end of the urethra. The part to be removed is covered with a piece of lint, and laid hold of with one hand; the body of the organ having been put upon the stretch, is then severed by one stroke of a long knife; or, by making an incision on each side of the member, the urethra may be first cut a little longer than the corpora cavernosa. Three or four vessels by the side of the

septum, and on the dorsum, may require ligature; and simple dressings with cold and tepid water are applied.

A second amputation of either the upper or lower extremities may sometimes be demanded, on account of the inconvenient length or tender state of the first made stump, and on account of the state of either the bone or soft parts. The extremity of the bone, when well covered, becomes rounded off and diminished in size; but if exposed, it becomes swollen through inflammatory action. It may be uncovered, and present portions in the process of exfoliation surrounded by a foul sore; or it is covered either by integument only, or by a thin pellicle of cicatrix, which, by exposure to friction and pressure, is brought into a tender and ulcerated state. Or, again, the nerves, whose extremities are always rounded off and somewhat tuberous, contract adhesions with either the end of the bone or the cicatrix; and, thus exposed to external impressions and injuries, they become inevitably diseased. The irritability consequent upon this neuralgic affection is felt seriously in other parts of the system, and undermines the constitution. In a great many of these bad and troublesome stumps a regular amputation is not necessary; the due proportion betwixt the bone and soft parts has not been observed, and, to establish this, a very small portion of the latter only need be taken away; in fact, only the thin covering on the apex of the cone. Two or three inches of the femur or humerus may be removed by merely making an incision, on the aspect opposite to the vessels, down at once to the bone; after cutting close round it, the soft parts are drawn to the inner side, and the saw applied. The vessels are small, the principal one being not interfered with; and even if it were, it would be found contracted and almost impervious to a considerable extent. The bone is now well protected, and the nerves are no longer pressed against it. If the patient has suffered much from neuralgia, it may be prudent to shorten the nerves at the same time with the bone. When there are two bones, and the stump is very much too long, flaps are required to be made; and the bones, when sawn, are left well concealed in the soft parts; in fact, the proceeding must be modified according to circumstances. I have had occasion to operate on some

dozens of bad stumps, and, as already hinted, the necessity for doing so will constantly arise, until more care is taken in performing this very easy operation, as it is considered, or until a better system of operation is in general use; there is no difficulty in removing a limb, certainly, but to do it well requires considerable dexterity, and careful attention to the various steps of the proceeding; in following a good plan, mistakes may occur, through carelessness or inattention, and bad enough stumps have resulted from the flap method.

Secondary hæmorrhage will sometimes follow when reaction has been established; the smaller vessels, owing to the patient being in a fainting state, not showing themselves at first. If the patient is very sick and low, and it is supposed that several vessels which may furnish blood afterwards have not been secured, it may be well to have him laid in the recumbent position, carried to bed and watched, the wound being left open. When the mode of dressing before recommended is pursued, the patient is put to no trouble or pain in again exposing the surface. Should bleeding by chance supervene in a few hours after the operation, the wet lint is merely removed, and the points of suture, if any have been made, cut; the coagulum is then taken out, and the bleeding vessels are at once seen and secured. But such bleedings are by no means so common, or so much to be dreaded, under the system of simple treatment, as when bandages and other complicated dressings were applied, heating the part, and interfering with the venous circulation.

Bleeding sometimes occurs at a later period, some six, eight, or ten days after the operation. This seems often to depend upon a sloughy and unhealthy state of the wound. The bleeding may be slight, and possibly may be arrested by removal of the clot, dry dressing, support and position; but, if profuse and repeated, means must be taken to arrest it permanently and effectually. For this purpose, the circulation into the part must be weakened by ligature of the trunk which gives off the branches which are implicated: the proceeding is generally effectual. It may, however, be proper, besides, for a time, to give uniform support to the wound, and to elevate the part.

I have had occasion to pursue the practice here recommended for secondary hæmorrhage, in a considerable number of cases in hospital practice. During one unhealthy season, I was under the necessity of tying the femoral artery four times, on this account, in the Royal Infirmary of Edinburgh, and assisted my excellent colleague, Mr. John Campbell, in a fifth case; the amputations had been performed below the knee, the bleeding was completely arrested, and all the stumps became healthy and did well.

[Very interesting researches have latterly been made in regard to the mortality attendant upon these very common operations. In the American Journal of Medical Sciences, for August 1838, and May 1840, I have given a statistical account of the amputations performed in the Pennsylvania Hospital, during the ten years from 1830 to 1840, from which it appears, that

Of eighty amputations on seventy-nine patients, thirty-five were primary, of which twenty-four were cured and eleven died, four of the deaths occurring within the twenty-four hours immediately following it.

Twenty were secondary, of which thirteen were cured and seven died.

Twenty-five were for the cure of chronic affections, of which twenty were cured and four died.

Thirty-two of the amputations were of the upper extremity, of which twenty-seven were cured and five died.

Forty-seven were of the lower extremity, of which thirty-one were cured and sixteen died.

Seven were amputations at the joints, of which four were cured and three died.

The conclusions drawn from an analysis of the tables published, are:

1. That amputation with us is to be regarded as an operation attended with much danger to the life of the individual, the mortality after it being 1 in $3\frac{7}{11}$.

2. That the chances of success after it, are much greater in persons who have been for some time suffering from chronic diseases, than in those who have it done while enjoying robust health, the mortality in the former class of cases being 1 in $6\frac{1}{4}$, while in the latter it is 1 in $3\frac{2}{11}$.

3. That immediate amputations after injuries are less fatal than secondary operations, the mortality after the former being 1 in $3\frac{2}{11}$, while in the latter it is 1 in $2\frac{6}{7}$.

4. That amputation of the lower extremity is much more fatal than that of the superior member, the mortality after the former being 1 in $2\frac{1}{1}\frac{5}{6}$, while in the last mentioned class of cases, it is only 1 in $6\frac{2}{5}$, and

5. That the danger increases with the age of the individual operated on.

Since attention has been directed to the subject, similar tables have been furnished from the Boston, Glasgow and Liverpool Hospitals, all of which go to confirm the conclusions drawn from the analysis of my own tables. Should these results be confirmed by still more extensive observations, many interesting questions in regard to the propriety of performing amputations in certain cases will arise, and reference is here made to them after, as well with the view of calling attention to this interesting subject, as of engaging those practising surgery in our country, whether in hospitals or otherwise, to make known through the different journals the results they have met with.]

CHAPTER XI.

INJURIES, LODGMENT OF FOREIGN BODIES, AND DISEASES OF MUCOUS CANALS.

The extremities of mucous canals occasionally suffer from the forcible introduction of foreign bodies; these may be sharp and irregular on their surface, or disproportioned in size to the passage. They may be immediately abstracted, or lodging may interfere with the functions of the organ, and, by their presence, cause great pain and uneasiness: by continued irritation, violent inflammatory action may be excited, terminating, perhaps, in disorganization of the tissues, or of the organ which they invest. It must always be the object of the surgeon to ascertain immediately and correctly, whether or not, and where, any foreign body is retained, whenever, by the circumstances detailed, or by signs and symptoms, he is led to suspect that such may possibly be the case. The effects, it is plain, cannot well be controlled, and are not likely to subside, so long as the cause remains in operation. The practitioner must, therefore, be prepared to adopt means suited to each case, and calculated to avert or subdue the consequences of the lesion.

Wounds of the conjunctiva, and of the surface of the eye, are more or less serious according to their extent and depth. If the tissues have not been penetrated very deeply, nor the chambers implicated, and if no foreign substance be impacted in the solution of continuity, then general antiphlogistic measures only are necessary; whilst, to prevent vascular excite-

ment in the part, cold spring water, iced or not, must be assiduously applied. If inflammation have set in before treatment is adopted, or if it have arisen in spite of it, the abstraction of blood, generally and locally, must be resorted to, and repeated to an extent proportioned to the importance of the part of the danger of disorganization. The cold applications must then give place to those of a higher temperature, the latter being more soothing and agreeable to the patient, and exciting a more beneficial influence on the local action. Penetrating wounds of the anterior chamber are not necessarily followed by loss of vision; those near the margin of the cornea are closed by projection of the iris, and the pupil may, after all, be little changed in form or situation. Wounds in the centre of the cornea, of considerable size, those of the sclerotic, all those which are attended with breaking up of the internal structure of the organ, and the disturbance and evacuation of the contents of the bulb, are necessarily dangerous or fatal to vision. In these cases, means must, of course, be taken to moderate and subdue inflammatory action. Foreign bodies may lodge on the surface, may be entangled in the superficial tissues, or may have found their way into the cellular and fatty matter which surrounds the eye-ball, or even into the chambers of the bulb itself. The presence of those on the exterior may be guessed at by the patient, or suspected by the surgeon, from continued irritation, pain on moving the bulb or lids, and lachrymation, coming on suddenly after exposure to a cloud of dust. By desiring the patient to keep the eye still, all foreign matter may be soon washed away into the inner canthus, and thence easily removed; some, however, may be detained, or it may be of such consistence and nature as to demand instant removal,—for example, very sharp particles of flint or metal, and irritative or escharotic powder, as snuff or caustic. By opening the lids fully in a good light, everting the upper one and turning over its cartilaginous border, the whole surface of the conjunctiva is brought into view; it being betwixt the bulb and upper lid that small foreign bodies most frequently lodge, every particle can generally be seen and certainly got rid of. There is no difficulty in effecting exposure of the inner

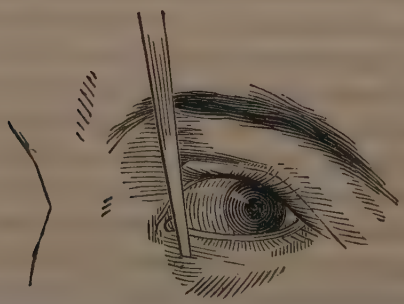
surface of the lids, by the use of a probe, pressed upon the upper edge of the cartilage, whilst the lid is pulled outwards by the ciliæ. But, by practice, this may be effected merely by the dexterous application of the points of the fingers of both hands, or even of one. The corner of a handkerchief, a hair-pencil, the flat end of a probe, or in fact any small instrument, may be employed for gently removing the foreign matter. A magnifying glass may be used in detecting some minute and transparent bodies, and sometimes a pointed instrument may be required to disengage them—as when pieces of metal are lodged in the cornea, whence it is sometimes a troublesome matter to extricate them. It is necessary to do so early, from all situations, in order to avert or cut short inflammatory action, or prevent the ulcerative process which will otherwise be set up in the tissues, in order to loosen and throw out the foreign substance, and which must be followed by permanent opacity. When difficulty occurs in operating thus upon the cornea, the surgeon will find it necessary to fix the bulb firmly by the proper position of the points of the fore and middle fingers of one hand; if not expert, the aid of an assistant may be called in, or a speculum resorted to. By incision of the cornea, foreign substances, such as a bit of copper cap, may sometimes be removed from the anterior chamber; but loss of vision is generally the effect, immediate or secondary, of such injuries. Large pieces of wood, or of metal, and portions of dead bone, may sometimes be extracted from the orbit by careful incision, and without permanent injury to the organ of vision.

The bony and cartilaginous parietes of the nostril may be shaken and displaced, and the mucous membrane disturbed and torn, by violence from without, by blows on the prominent part of the organ, or by forcible introduction of foreign bodies into the cavities. Coarse handling of the parts, in attempts to remove polypi, has been reprobated in a former chapter. The consequences of injury, inflammation, abscess, troublesome ulceration, and deformity are to be dreaded. Accordingly, to insure a speedy and satisfactory termination to the case, displacements must be remedied, foreign bodies removed, inflammatory action kept under, and matter speedily evacuated, if it has been per-

mitted to form under the pituitary membrane. Many of the deformities consequent upon destruction of the cartilaginous or bony septum, or of the columna, with sinking of the organ, are traceable to neglected inflammation and abscess following injury. The free passage of air is occasionally prevented by chronic swelling and congestion of the vessels on the Schneiderian membrane, attended by increased discharge; and this may or may not be the result of an acute inflammatory attack. The nature of the case must not be mistaken; it may be remedied by emptying the vessels by scarification, or by the occasional application of two or three leeches to the membrane, and by slightly astringent and stimulant lotions, powders, or ointments. Foreign substances, such as seeds, kernels of fruit, glass beads, &c., are often lodged deeply in the nasal fossæ of children, more especially in the fissure betwixt the anterior and posterior cavities; and often enough, they are impacted more firmly by awkward and ill-directed efforts to remove them by forceps. The membrane swells, and soon becomes tender. The foreign body also may absorb moisture and increase in size, and the difficulty of removing it is thus much increased. At any period, by placing a small bent scoop or curette behind the substance, it can be readily dislodged, it may slip into the throat, but generally it can be made to appear at the anterior opening. The patient must be firmly secured, and a good light chosen; the extraction can then be effected without much pain or trouble; his struggles and screams are disregarded, for the object must be accomplished in the first instance. The difficulties are all increased by delay and repeated futile attempts.

Obstruction of the nasal duct from affections either of its mucous lining, or of its fibrous or bony parietes, is productive of great annoyance, distension of the sac, discharge of its contents into the inner canthus and on the cheek, weakness of the eyes and lachrymation. This epiphora may be followed after a time by excited action of the lining membrane, greater distension, inflammation of the coverings, and abscess in the corner of the eye. This, again, is succeeded by a lachrymal fistula. In the first state of matters, the patient obtains relief by emptying the sac from time to time by gentle pressure; slight astringents ap-

plied to the conjunctiva, and thence taken into the sac, afford relief, as do very small blisters applied to the integument of the part, and repeated as occasion may require. The ductus ad nasum, moreover, may be opened by the gentle and careful introduction of a probe, properly bent, from beneath the inferior spongy bone. Dexterity in this operation, as in many others, must be acquired by careful study of the construction and course of the canal, and by repeated trials on the dead body. Small steel sounds are made by the instrument makers for this purpose, and are better suited for it than a bent probe. The point of the instrument, with the convex margin upwards, is passed along the floor of the nostril until a slight eminence on this surface is felt; it is then turned upwards, and by a slight pressure will enter the nasal duct. The first performance of this operation on a patient is the most difficult, the small valve which exists at the opening of the duct into the nostril is torn through, and the instrument will be found to enter with much greater ease after this is destroyed. When the periosteum of the passage is affected, abstraction of blood by leeches applied within the ala will afford relief, as also in the acute affection of the mucous lining, whether proceeding from below or above. In the more permanent obstruction, attended by abscess or fistula, the canal must be re-established by the introduction of instruments from above. An opening is effected through the coverings and sac into the nasal duct, by inserting a narrow knife at once and without preliminary scratchings or incisions of the surface, thus; care being taken that the point of the instrument



passes in the right direction, from behind the nasal process of the superior maxillary bone, downwards and backwards; a probe or style is then slid along the blade as it is withdrawn. The sign of its having reached the nostril is the discharge of blood from the cavity, and afterwards the forcing of air, with mucous, upwards through the puncture. Difficulty is sometimes experienced when the bones are uncovered and necrosed; and errors are occasionally committed even when these are sound, the instruments being passed too much backwards, and forced through the thin lachrymal bone,—into the cavity of the nostril, doubtless, but below the superior, instead of the inferior, spongy bone. A bistoury, with a groove on its posterior and lateral aspect, or a sharp-pointed director, have been used to conduct the style; but the operation can be well enough managed without such assistance. The nail-headed style must be sufficiently long to rest in the nasal fossa; it is removed, cleaned, and replaced from time to time. After a short period it may be taken away entirely, the passage being kept clear by occasional introductions of the probe from below; or the patient may wear, during the night, a very small style, which there will seldom be any difficulty in inserting through the minute and almost imperceptible fistulous aperture that remains. This mode of managing epiphora and fistula lachrymalis will be found preferable to the introduction of small probes through the puncta, the injection of the sac through these, the passage of setons, or the retention of tubes in the nasal duct. The first of these plans is inefficient; the last often answers for a short time, but in the greater number of cases, sooner or later, leads to trouble and mischief. It becomes necessary to extract the foreign body, and difficulty is occasionally experienced in the operation. The head of the tube must be exposed by incision; and a small probe, with a sharp male screw upon it, having been fixed in its canal, it is thus secured, and removed by traction upwards.

Foreign bodies are extracted from the meatus auditorius in the same manner as from the nasal fossæ, great care and delicacy in the proceeding being equally necessary, in order to guard against injury of the deep parts, laceration of the mem-

brana tympani, or disturbance of the ossicula, and interference with the other delicate and important apparatus. Specula will be found very useful in many cases, when a careful examination of the nose or ear is necessary. The presence of substances which interfere with the functions of the organs, and which may otherwise prove inconvenient, is thus readily detected, and means of relief determined upon. Accumulations of cerumen and foreign matters, such as wool or cotton, which give rise to uneasy feelings, noise, confusion, and deafness, are easily loosened by the nice and careful injection of tepid fluid, repeated as may be necessary. Causes of deafness are removed by some of the operations in the fauces and posterior cavity of the nostrils already described, and by attention to the state of the jaws and teeth.

Deafness caused by closure of the Eustachian tube may be remedied by admitting the air into the cavity of the tympanum by means of an opening through the membrane. The operation is performed by bringing that membrane into view by means of the speculum, and placing upon it a small and sharp punch, and with a light, quick turn of the instrument a portion of the membrane will be cut out; the removal of a small portion is necessary for the establishment of a permanent opening; mere punctures with needles or trochar, soon close. Solid or hollow probes slightly bent towards their points may also be passed into the Eustachian tubes along the floor of the nostril, and without the slightest difficulty; the canals may thus be opened, and injections of air and vapour made into the internal ear. From this practice (of late being absurdly and quackishly employed in all sort of cases of deafness, no matter from what cause originating,) benefit can seldom be expected to accrue.

Partial closure of the mouth occurs after injuries: when the lips are severely lacerated and allowed to unite during the healing of the wounds, the size of the opening of the mouth may be much diminished. The best mode of restoring the original size of the opening is to remove a portion of the integument and cicatrix from the mucous membrane. Then incise this along the centre of the wound, and by turning it out and uniting it above,

below, and at the angle, with the skin, a fresh prolabium is at once formed, and the edges of the wound at the angle are prevented from uniting.

Penetrating wounds of the mouth are managed on general surgical principles. Those which implicate the parotid duct are occasionally troublesome and difficult to treat. A salivary fistula is formed, and in order to get rid of this, it is necessary to puncture the membrane of the mouth obliquely, both backwards and forwards, from the external opening; a piece of thick and flexible wire is then passed through the openings, and the ends gently twisted in the mouth. Applications are afterwards made to the fistulous orifice,—such as a small actual cautery, or a potential one,—so as to cause contraction and ultimate obliteration of the sinus. Lodgment of foreign bodies in the loose submucous cellular tissue has sometimes been overlooked, and great and serious danger has ensued from the consequent infiltration, inflammatory swelling, and abscess. Several cases in which the stalk of a tobacco-pipe had lodged in this situation have been recorded; death has sometimes been the ultimate result. The propriety of instituting a timely search for, and removing such a source of mischief, need not be insisted upon. Some of the evil consequences arising from a bad condition of the teeth and alveolar processes have been shortly adverted to in Chapter IX. But as yet, sufficient importance is not generally attached, nor due attention given, to the exciting causes of many of the swellings, abscesses, ulcers, and tumours of this cavity and its neighbourhood.

INJURIES OF THE GULLET.

The pharynx and œsophagus are occasionally injured by the introduction or impactment of foreign bodies. The lining membrane may be lacerated by sharp portions of bone, which, penetrating the membrane, lodge partly in the submucous tissue; and there their presence for any time is likely to be attended with great and dangerous swelling, or with unhealthy and gangrenous abscess. Coins, or pieces of hard, gristly, and tough meat, may be retained, so that their dislodgment, either upwards or downwards, is attended with difficulty. Small-pointed

bodies are sometimes entangled for a time in the mucous covering of the fauces or gullet, and occasion by their presence great uneasiness and alarm. This passage is not unfrequently seriously injured by fluids of an irritating nature, incautiously swallowed, as acids, strong alkaline solutions, &c.

Solid substances may be removed, though sometimes with great difficulty; but the inflammatory action, in any way induced, is often followed by permanent thickening and contraction of the parietes, generally at the commencement of the œsophagus, immediately behind the cricoid cartilage. The pharynx is often remarkably dilated in consequence. There is a great accumulation and discharge of stringy mucous fluid: the patient swallows with great difficulty, and after very protracted and painful efforts. The narrowed canal is apt to be blocked up entirely by the impactment of small portions of solid food; emaciation follows, and, by the efforts to free the fauces of the viscid discharge, the lungs are liable to be ultimately drawn into disease. Abscesses, connected with dilatation of the passage, occasionally form by the side of the neck, and the induration sometimes assumes a malignant action. In some cases, morbid structure, of a carcinomatous or medullary nature, is the cause of the obstruction from the first.

The introduction of instruments into the fauces and gullet is frequently required, for the removal of foreign bodies which have lodged there; and in some cases immediate recourse must be had to the operation, on account of interference with the functions of the larynx, and risk from threatened suffocation. Small sharp substances, as pins, needles, and fish-bones, are usually fixed in the mucous membrane over the root of the tongue, at the base of the arches of the velum, and within reach of the finger; they can generally be disentangled and removed, by the skilful use of long and slightly-bent forceps guided by the finger. Foreign matters, of large size, impacted in the narrow part of the canal, if of soft consistence, can be pushed down by the introduction of a probang,—a small bit of sponge, or, what is better, a small ovoid and smooth piece of ivory, firmly secured on a whalebone rod. In introducing this instrument, the head and face are so placed that the canal is brought nearly

into a straight line. The patient is desired to make an effort to swallow, as the ball is passed over the root of the tongue; it is thus easily slid over the epiglottis, and enters the gullet. The pressure must be very gentle on the obstructed part. If the passage has been previously constricted, a smaller instrument of the same kind may be tried, or an œsophagus bougie substituted. Hard and angular bodies must be brought upwards; and for the purpose of seizing these, long bent forceps will be required to insure a successful issue to the attempt—one pair being made to open laterally, another from behind forwards. The finger is passed as a guide, and the same precautions are taken to avoid interference with the glottis, as in the use of the probang. The cause of the obstruction is felt and seized. The extraction of pieces of bone, or other sharp and irregular bodies, as glass or broken china, must be managed cautiously; the dread of still further injuring important parts being ever before the eyes of the surgeon. Flat and smooth substances, such as coins, may be disentangled readily by a flat, blunt hook, fixed on a piece of whalebone; or by a piece of thick, flexible wire, twisted and bent to a convenient form. A foreign substance has been so fixed in the gullet, that it has been considered impossible or unsafe to dislodge it either upwards or downwards. Nourishment could not be received into the stomach; and the respiration, it has been thought, might thus be interfered with by pressure on the posterior membranous surface of the air-tube. But the obstacle is almost uniformly lodged behind the cartilages of the larynx, which are tolerably incompressible. In these cases, an incision has been made into the œsophagus from the side of the neck, on its left side; the foreign body has been felt, and care being taken to steer clear of the vessels and nerves, more especially the inferior thyroid and the recurrent, the tube has been cut through, and extraction accomplished. But the necessity for this proceeding can seldom arise.

INJURIES OF THE WINDPIPE.

Patients labouring either under the effects of injury, or under disease, of the air-passages, require to be promptly attended to, and very judiciously treated. The physiology of the organs

must be carefully studied, and the functions perfectly comprehended of that "outwork," as Mr. Porter of Dublin, in his excellent work, has denominated the glottis; the pathological changes, likewise, must be thoroughly and well understood by the surgeon who proposes to undertake the management of such cases. Injuries from without are constantly presented to the notice of the profession; not a week passes without some cases of attempted suicide, by wounding the windpipe, being detailed in the public prints. Very generally a most mischievous practice of stitching up the wound closely is, at the same time, described as having been adopted,—a practice calculated to cut off all chance of recovery, which, in some instances, is very desirable, and even anxiously wished for by many of the unfortunate individuals themselves. The detail is often to this effect:—A servant went to fetch some water; on returning, "he discovered his unhappy master lying on the floor, weltering in his blood, having cut his throat with a razor; surgical assistance was procured as promptly as possible, and the wound sewed up, but no hopes are entertained of his recovery." It should be added, rather, that in consequence of the ill-timed interference and misdirected attention of the surgeon, every ray of hope had been shut out from the poor sufferer. One other example may be given. Some bricklayers passing homewards across the fields "discovered a gentleman lying, bleeding copiously from a wound in his throat, which he had inflicted with a razor. They immediately conveyed him to a surgeon, by whom the wound was sewed up; and he afterwards removed to the infirmary, where he lies in a precarious state:" and it would be very wonderful indeed were he not in the very greatest jeopardy, considering the treatment to which he had been so unwisely subjected. The same remarks apply to the treatment which, from the same authority, appears to be generally adopted after severe accidents. A person receives a serious injury of the head, chest, or limbs; he is taken up pale, bleeding, and insensible; and is carried to a practitioner, perhaps an unlicensed one. He expires shortly after, or, it is said, is not expected to recover, notwithstanding "he had the most prompt assistance afforded, and was immediately bled." The injured person has,

in such circumstances, a much better chance of recovery when let alone for a time, to allow re-establishment of the circulation, than when exposed to such misapplied attentions, and subjected to such unceremonious and ill-judged practice, as abstraction of the vital fluid at so improper a time, when it can be little spared, and when in fact the loss of a very trifling quantity will go far to extinguish the small remaining spark of life.

Wounds of the fore part of the neck, and of the blood-vessels in that region, are treated of at p. 196. The implication of any part of the air-tube increases the danger very considerably. The division may be partial or complete; it is almost uniformly across the axis of the tube, and is met with at all points, from opposite the top of the sternum to the root of the tongue. In a great many instances, the os hyoides and tongue are severed from the larynx; the mouth is sometimes penetrated above the epiglottis; the box of the larynx is cut into through the thyroid cartilage, or crico-thyroid membrane; more rarely the trachea is penetrated; in some cases, the pharynx is opened at the same time with the larynx. The mode of managing the hæmorrhage, one immediate source of danger, has been already adverted to; the patient is watched when re-action occurs. In those who have attempted suicide, this state of mind is often unfavorable to recovery, they may still be determined to quit the world, and, if not restrained, may take active means to accomplish their end. They may tear open the wound and induce recurrence of the bleeding, or, by introducing the fingers into the open windpipe, obstruct the entrance of air. They sometimes refuse sustenance, and by their despondency and carelessness of life do away with every chance of a cure. But, independently of those circumstances, there are many physiological difficulties to be overcome; the air and secretions pass out through the wound, as do also, in many cases, liquids and portions of food received into the mouth; this occurs, in some cases, though the œsophagus be unopened, owing to disturbance of the functions and imperfect closure of the glottis. Besides, blood and serum are liable to be drawn down in such quantity as to obstruct the bronchial tubes and air-cells. If the wound is below the glottis, the patient is deprived of the power of expelling the fluids that

may be secreted in the windpipe, or that may pass thither from the wound. He is liable to inflammation of the lining membrane of the air-passages, (bronchitis,) in consequence of the entrance of cold air directly into them, without previous admixture with that in the upper part of the canal, and in the mouth and nostrils,—which in the natural state has been respired, and is of a higher temperature than the atmosphere. Again, when the wound has been to a certain extent approximated, the patient is in danger of suffocation, from mal-adjustment of the cut surfaces. Sometimes, as when the wound has been inflicted by several applications of the cutting instrument, and with an unsteady hand, portions of the cartilages are partially detached, and hang loose either in the opening or into the tube, and obstruct the respiration more or less, according to their situation. Generally, the entrance of air is more easy than its escape; difficult inspiration, however, is experienced when the epiglottis is detached from the root of the tongue. Swelling of the soft parts around or in the interior of the tube, from inflammatory œdema, or infiltration into the submucous tissue, often gives rise to difficult respiration, proving suddenly fatal if overlooked and neglected. The mucous, much increased in quantity, vitiated, viscid, and tenacious, in all such cases, is got rid of with great difficulty, and is apt to be entangled in the opening thus constricted and narrowed. It is from this cause, and not from any spasm, that the fits of threatened suffocation are induced, both after injury and in some diseases of the part. The patient, after breathing for some time with difficulty, his inspirations long and whistling, starts from his disturbed sleep, grasps at the nearest object, and falls down lifeless.

The treatment must be conducted so as to obviate these dangers. The wound is of such a nature as regards its direction and the parts implicated, that immediate union is neither possible nor desirable. The treatment and the result are very different when the wound is longitudinal. Even superficial transverse wounds which do not reach the muscles, seldom heal without a good deal of discharge, and always by the second intention. The motions of the head and neck, the change of position in the parts caused by the action of the muscles of the tongue and

larynx, and the constant passage of fluids, when one or both canals are open, through the wound, are all opposed to union. Immediate opposition of the divided surface is attended with great danger; the blood, as it flows from the vessels, encouraged by the confinement of soft coagulum, passes by suction into the windpipe; some of it may be ejected, but the lower part of the tube is not very irritable, and at the same time the power of coughing is diminished, so that a great proportion trickles down and gradually fills the extreme branches of the tube. The breathing is in consequence quickened and slightly embarrassed, yet everything may be supposed to promise well; the patient, however, in making some slight exertion, without giving any warning to the inexperienced, falls suddenly into a state of asphyxia, and is lost. The same may happen at a later period, from the secretion of serum or accumulation of mucosity. The tubes and cells are found loaded, and the lungs condensed.

After the bleeding vessels have been secured, the patient should be placed in a room of proper temperature, with the fore part of the neck protected by some loose covering, as a muslin or gauze handkerchief, or, what is still better, a worsted comforter. The loose texture of this becomes somewhat heated, the expired air is retained in it, and mixes with that which is drawn into the air-passages during the next expansion of the chest; the danger of bronchitis occurring is thus so far obviated. When matters have been permanently arranged as regards position, one of Mr. Jeffrey's respirators may be applied with great advantage,—a most ingenious and useful contrivance, and one of invaluable and vital importance to individuals liable to, or suffering from, pulmonary affections. The inspired air will thus be brought to the same temperature as in natural respiration; and upon attention to this, much of the success in the management of the case will depend. The solution of continuity cannot, with safety or propriety, be brought together for many hours after its infliction; not until all oozing has ceased, and the surface become glazed. No purpose is to be gained by closing the wound accurately by stitches and plasters; if it extends laterally to a great extent, a single point of suture may be inserted through the integument, near each extremity; but the centre

cannot heal by adhesion, and no attempt need or ought to be made to close that part immediately.

Great and imminent danger, as has already been pointed out, arises from closure of the wound and the consequent inhalation of blood; but even though the air-tube have not been opened, the patient may be put in great jeopardy by close apposition of the edges of the incision. Blood is apt to accumulate in the cavity, and coagulates; hæmorrhage is thus kept up; and the size and pressure of the clot may even interfere with the function of respiration.

Case.—A young woman was admitted into the North London Hospital, some years ago, on account of a transverse wound in the front of the neck, over the upper part of the thyroid cartilage. It was ragged, having been inflicted by repeated application of a cutting instrument, and the integument had been somewhat detached from the subjacent parts. The wound had been stitched closely before her admission; and the then house-surgeon, disregarding the common-sense view of the case, unfortunately did not throw the edges loose, even though the wound had bled repeatedly after the patient's admission to the hospital, and she could not breathe with freedom. I was making my visit in an adjoining ward, when the nurse rushed in to say that her patient was dying of suffocation, and she was correct in her statement; the poor girl was gasping for breath, with a livid countenance, and scarcely any pulse. The stitches were immediately cut out, and a large clot removed. There was no farther bleeding, the breathing became unembarrassed, and all did well.

By position of the head, by approximating the chin to the top of the sternum, and securing it there by the turn of a double-headed roller, the ends being fixed to a band embracing the chest, all gaping and retraction of the edges are prevented, and the parts put in a favorable state for union by the second intention. So long as air passes through the wound, no dressing need be applied; the discharges are merely wiped away, and the neck covered as directed above. In wounds which do not penetrate very deeply, the patient can take sufficient support at any stage of the case; but when the pharynx is implicated, it

will be necessary, from the first, to convey, at proper intervals, liquid nourishment into the canal beyond the wound. There is no use in passing long tubes into the stomach, or in retaining them for this purpose; a large elastic catheter and gum-bottle, introduced as occasion requires, will be found quite sufficient for the purpose. When the edges are thus retained by position of the head, and unless the wound be very extensive indeed, the patient will find no difficulty in clearing the windpipe of the mucous secretion, which is often abundant and viscid; the more so, if the precautions against entrance of cold air into the passages have been strictly enforced. If difficulty is experienced in expectorating from the wound,—supposing, as is often the case, that the breathing is for a time carried on in a great measure through it,—instructions should be given to the patient to narrow the aperture to the part, during his attempts at coughing, by the application of one or more fingers. Should the respiration, at any period, get embarrassed, the inspirations becoming rare, noisy, and difficult, the utmost attention must be given to the case; the cause must, if possible, be removed, and should suffocation be threatened from the great and often rapid narrowing of the opening, by œdematous swelling and the entanglement of viscid discharge, then it may be prudent to open the windpipe longitudinally below the obstructed parts.

A great error is sometimes committed in the treatment of cut-throat. The patient is fed through the wound in the neck, the contraction is not favored by position, and the surfaces are permitted to cicatrize separately; the voice is consequently lost; and the patient not having any control over his respiration, and being thus unable to keep his chest expanded, is also rendered perfectly incapable of exertion. He is, moreover, put in great jeopardy; he is subject to bronchitic attacks, and to inflammatory œdema of the orifice through which the air enters; he may in consequence be cut off suddenly, if in the hands of ill-informed or inexperienced persons, or he may be worn out by cough and profuse expectoration. It is possible occasionally to remedy even such mismanaged cases; the contracted air-passage above may be widened by the introduction of instruments, and the edges of the wound may be pared and brought together. A

very remarkable case of the kind, which occurred in my practice, is detailed in the Edinburgh Medical and Surgical Journal, No. xciv. p. 118, and in the "Elements of Surgery," 2d edition, p. 435. The patient had, for many months, breathed entirely through the opening, in which she wore a large round tracheotomy tube. After dilating the passage leading upwards into the glottis, which had been almost entirely obliterated, I closed the wound; and although it was necessary to perform tracheotomy on account of the swelling which supervened and threatened suffocation, a few hours after the removal of a piece of elastic tube which had been worn for many days in the trachea, a perfect recovery took place, the breathing became free, and the voice was almost perfectly restored.

The respiration is sometimes interrupted for a time, and the functions of the larynx interfered with, in consequence of injury, such as a blow, or contusion on the fore part of the neck. Emphysema may arise from division of the membrane connecting the rings of the trachea, or from fracture of the ossified cartilages of the larynx; and inflammatory action may be lighted up in consequence, causing difficult breathing, loss of voice, and pain in deglutition, with more or less fever. A case is related in the "Elements of Surgery," 2d edition, p. 447, in which the breathing was suspended almost entirely, in consequence of an injury on the fore part of the neck. A little girl fell in running across the street, and struck the larynx with great force on a large stone. She was almost moribund when seen shortly after; the trachea was opened longitudinally, respiration established, and a complete cure effected. It was found necessary to retain the tube in the wound for eight days, until the swelling had subsided, and the functions of the muscles of the larynx had been restored.

The glottis is injured by the introduction of noxious fluids by the mouth, as strong acids. A case was brought lately to the North London Hospital, in which the breathing was suspended in consequence of the patient, a little girl, having attempted to swallow a mouthful of undiluted sulphuric acid. Tracheotomy was performed by my colleague, Mr. Quain, and respiration established by inflation of the lungs, persevered in for some

time. A tube was introduced, but withdrawn within two or three days; a suddenly fatal termination took place in the night, from accumulation, it would appear, of viscid mucus in the trachea and larynx, which the swollen state of the rima rendered it impossible for the poor child to remove.

The swallowing of heated fluids, or the inhalation of the steam or boiling water, as from the spout of a tea-kettle, is attended with a certain degree of excoriation of the mouth and fauces. But it is the glottis which suffers most seriously in these cases, and of which the consequent affection is to be dreaded. The respiration very soon becomes much hurried, the inspirations are sibilant, the features suffused, the lips blue, the veins of the neck distended, and a short tickling cough troubles the patient. There is pain and difficulty in deglutition. Post mortem examinations have shown, in addition to excoriation of the mouth and fauces, an infiltration of serum into the submucous tissue of the rima glottidis, with small and numerous vesicles on the surface, unnatural redness of the membrane within the larynx, and a coating of viscid mucus or of lymph. Should repeated doses of calomel, assisted by leeching, fail in arresting the urgent symptoms, and suffocation is dreaded, recourse must forthwith be had to tracheotomy; in all such cases, temporising and delay are perfectly inadmissible; for, in consequence of the difficult respiration, and the imperfect circulation through the lungs, the vessels of the head soon become congested, effusion follows, and the patient is lost.

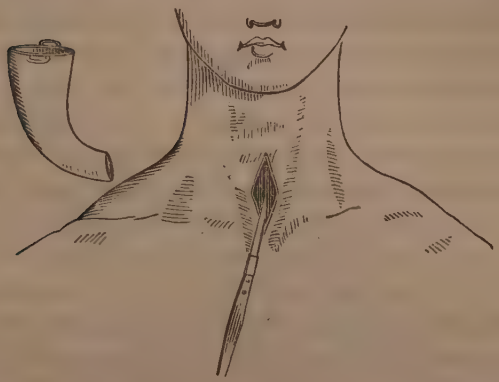
The lodgment of foreign bodies in any part of the respiratory apparatus is always an alarming and dangerous occurrence, and if they be not removed, a fatal termination must sooner or later ensue. The patient may be suddenly suffocated very shortly after the accident has taken place; or the distressing symptoms may abate and recur suddenly either in a few hours or days, or after the lapse of some time; cough, profuse and very fœtid expectoration, wasting, and other consumptive symptoms ensue, and then the escape or removal of the foreign body will, in all probability, prove of little avail. The signs and symptoms, of course, may be expected to vary, according to the form, size, and nature of the foreign body, and the situation which it occu-

pies; according, also, as it is moveable or fixed. The substance may be entangled for a time, in either the upper or lower part of the windpipe, and then escape; or it may continue to shift its ground, and again become impacted, either in the same or some other situation. The diagnosis is not always easy, more especially in children; perhaps the history is incomplete, and the symptoms at the time are not well marked. If a foreign body is said to have passed into the throat, any doubt, as to its having entered and lodged in the gullet, can soon be removed by the introduction of a ball-probe. The symptoms must then be watched, and a correct examination instituted. In the first instance, the patient may have experienced a sense of impending suffocation; he will have been greatly agitated and alarmed during the passage of the foreign body through the glottis; and for a time the inspirations may have been difficult and noisy, the expirations short and forcible, with efforts to get rid of the source of irritation by coughing. The body, if smooth and not very large, may have entered readily and without much excitement, the glottis being expanded during inspiration; but, even though quite loose, it cannot escape so readily, in consequence of the narrowing of the tube during expiration. After the first paroxysm of coughing, a calm of some duration may follow and continue for a considerable time, so as to lull all suspicion. But again the substance, if loose, comes in contact with the rima glottidis, the sensibility of which is extreme, and all the suffering, alarm, and agitation, are renewed. A peculiar, noisy, and characteristic râle is perceived upon applying the ear, and a shock like the shutting of a valve can be thus appreciated, or even by the finger placed upon the larynx, when the foreign body is, by the forcible expiration, made to strike the rima. The entanglement of a substance in one of the ventricles of the larynx naturally causes sonorous râle, loss of voice, occasional cough, and difficult inspiration; the symptoms are constant, and increase in severity as swelling takes place, and as the secretion becomes vitiated and profuse.

The presence of a foreign body in one of the bronchi may sometimes be ascertained by sensible signs; the right bronchus, being the largest and most directly continuous with the trachea,

is almost uniformly the one into which it is received. The signs vary according as the tube is filled entirely or not, and that will depend on the form and size of the mass. The respiratory murmur in the lung and bronchus may be extinct, or it may merely be diminished in loudness, and less marked than on the opposite side, whilst on percussion the sound is equally good. The murmur may be heard after coughing, when dislodgment of the substance has been effected for a time. A curious case is related by Mr. Macnamara of Dublin, in which the signs of a foreign body being present were very unequivocal; a plum-stone, perforated and used as a whistle, dropped into the windpipe and lodged in the right bronchus; the air rushing through the opening caused a distinct whistling sound. An opening was made in the crico-thyroid membrane; and, the signs disappearing, it was thought that the substance had been forced through the glottis and swallowed; but in eight days the same signs returned, the opening was enlarged, and the foreign body was at last ejected during a violent paroxysm of coughing. A great many cases have lately been collected and published, in which foreign bodies had been lodged for a time in the air-passages, and ultimately ejected. A button mould, nail, ear of grass, cherry-stone, pieces of bone, of wood, of woollen stuff, false teeth, &c. &c., have been got rid of by patients, without much, if any, assistance from their medical attendant, after many months of suffering from cough, hectic fever, and fetid expectoration. Many of these substances are said, but without any very satisfactory evidence, to have been lodged in the right bronchus, and it is probable that most of them were so placed. Some few of these individuals recovered by chance; in others, the marasmus continued, and they soon after perished,—all in consequence of neglect to ascertain the true nature of the disease, and not removing the exciting cause of the mischief in proper time. In some of the cases the attendant was kept in ignorance, any mention of the entrance of a foreign body into the air-passages having been omitted by the patient. Other cases are on record, in which foreign substances have been found, at the end of some years, in the cavity of an abscess in the lungs. There can be no question, when a foreign body has

entered into the air-tube, that the sooner it is got rid of the better, whether it lodges in the larynx, floats loosely in the trachea, or is impacted in one of the bronchi. Every available means must be adopted by the surgeon, to enable him to arrive at a correct understanding of all the circumstances of the case. He must make sure that there really is a foreign body in the tube. He must ascertain its nature as regards form, size, and surface; he must make up his mind as to where it is placed, and whether it is loose or fixed. In some cases there can be no doubt; and the means of relief, owing to the urgency of the symptoms, must be adopted promptly and on the spot. In others, again, there is great occasion, and time also, for deliberation on the nature of the case, and on the practice to be pursued; as the symptoms, though not admitting of long delay, are not urgent or pressing, the patient having been for weeks or months previously much in the same state. No trust is to be put in any therapeutic means, even in the most chronic cases. Errhines, emetics, and demulcents, are alike useless. The existence of a foreign substance having been clearly ascertained, an opening must be made into the trachea. If loose, it will generally appear at the opening and be ejected, or it can be laid hold of, and its escape facilitated, by the use of a small scoop or bent probe. If fixed in the larynx, entangled in the rima, or lodged in one of the ventricles, it can be felt by the introduction of an instrument upwards; it can then be either displaced upwards into the fauces, or brought down through the opening in the neck. But should the bronchus be the seat of the obstruction, then the surgeon must be prepared to encounter greater difficulties. He must provide himself with a long probe and forceps bent variously, fashioned at the point according to the size and form of the substance he expects to meet with, and made to open, some laterally, others in the opposite direction. The opening in the neck is made as here represented. A small scalpel is best suited for the purpose; in the adult an incision of an inch and a half or two inches is made, the extent varying according to the thickness and length of the neck,—the depth, in fact, at which the windpipe is placed from the surface. The opening is made to extend from immediately below the cricoid cartilage to near



the top of the st rnum, and exactly in the mesial line. The skin and superficial fascia are first divided, the fatty matter underneath is cut through, and the deep fascia is exposed and slit up over the junction of the sterno-hyoid muscles; their cellular connexions are then separated with the point of the knife; with its handle, and with the finger, by which it is ascertained that no stray arterial trunk lies in the way, the fore part of the trachea is cleared of the loose cellular tissue and congeries of veins; these are pushed downwards, and the isthmus of the thyroid body, if it exists, pushed upwards. The patient is desired to swallow his saliva; the moment is then seized when, by this action, the larynx is elevated and the tube elongated; the point of the knife is entered into the rings with its back towards the sternum, and, by a slight sawing motion, three or four of them are divided upwards, and in the middle line. By proceeding thus, there is seldom bleeding to any troublesome extent, nor is there any occasion for tying vessels, or for pausing before completing the opening. In children, difficulty is sometimes experienced in consequence of the shortness of the neck and the flow of venous blood, increased by the struggling and screaming of the patient. Occasionally the cessation of bleeding need not be waited for; as, upon the completion of the operation and the expulsion of the foreign body, the child generally becomes calm, the breath is unembarrassed, and the oozing ceases instantly. Great assistance is obtained from the use of a small sharp hook,

by which the tube is fixed before any attempt is made to open it. The alarm, consequent upon the admission of air thus unnaturally into the ramifications of the trachea, having subsided, a search is instituted for the foreign body by the introduction of the probe. The forceps follow this, and by their gentle and cautious use the object may be attained.

Only one case, I believe, is on record, in which a foreign body was actually discovered in, and removed from, the bronchus during life. The circumstances are fully detailed by Mr. Duncan, surgeon, Edinburgh, in the "Lancet," vol. ii. 1833–34, p. 419. Mr. Duncan was my house-surgeon in the Edinburgh Royal Infirmary, at the time I performed the operation; and in

this capacity I had the advantage of his services, and very able assistance, for a long period, both in that institution and in the North London Hospital. The patient, a female, aged 37, had, at least six months previously, got a piece of mutton-bone entangled in the glottis, whilst eating some hashed meat. By a great effort, during a fit of threatened suffocation, she succeeded in dislodging it; but it passed downwards into the trachea. She described very accurately her feelings at the time, the relief she had when it left the rima, and the sensation produced by its passing down till it lodged permanently under the right sterno-clavicular articulation. An attack of bronchitis supervened, followed by cough and expectoration, and the inflammatory attack was repeated several times; from one of these, she had just recovered, when she presented herself to me. The history was very clear; the inspiration was somewhat noisy, and there was some degree of peculiar sonorous râle perceived on applying the ear to the chest, at the point described as where the foreign body had become fixed. The operation was performed as above directed; one pair of forceps, opening laterally, were introduced; a hard substance could be felt, but not grasped; the patient was re-assured, and allowed to recover the effects of the exploration and attempt to seize it. Another instrument, with the blades differently arranged, was then passed down the tube, at least three or three and a half inches, and the bone immediately seized and extracted. Cold water was applied over the wound for some hours, and after all risk of oozing, and escape of blood into the trachea, or of air into the cellular tissue had ceased, it was put together with a bit of plaster. The result of the case was most satisfactory; all the symptoms ceased, and the patient was speedily restored to the enjoyment of perfect health. The two pairs of forceps and the bone are sketched in the preceding page. The length of the forceps is seven inches.

Great swelling of the tongue, closing the posterior fauces and preventing the passage of air through the nose, may require, if free incisions in the organ should fail in giving relief, the operation of laryngotomy.

Severe inflammatory swelling of the tonsils, uvula, &c., may threaten suffocation; and, in some very severe cases, life can

only be protracted by an opening in the crico-thyroid membrane.

Tumours of the œsophagus, polypid tumours situated about the upper opening of the larynx, or any large and hard substance impacted in the œsophagus, may press to such a degree on the trachea or larynx, as to impede the entrance of the air. Such extreme cases would also require the performance, and without delay, of the operation of laryngotomy.

DISEASES OF THE LARYNX AND TRACHEA.

It often becomes necessary to resort to the operation of tracheotomy, on account of obstruction to the free entrance of air into the lungs, caused by disease at the top of the tube. But the operation is not often admissible in cases of acute inflammation, the cynanche trachealis, either in children or in adults. In the first stage, whilst active antiphlogistic remedies are indicated and considered likely to afford relief, it could not with propriety be proposed. In the latter stages, after lymph has formed,—the extent of which it is impossible to predicate very correctly,—when the lungs are gorged, and effusion has commenced at the base of the brain, no good purpose can be answered by any operation. In some few cases of acute disease, more especially in the cynanche laryngea of adults, and also in the purulent laryngitis—well described by my then assistant, Mr. James Miller of Edinburgh, in one of the early volumes of the Medical Gazette,—the happy moment for interference may be chosen; and if the trachea is opened, instead of the larynx at the crico-thyroid membrane, there is a chance of getting below the part which is involved in disease, and obstructed by either plastic effusion on the surface, or deposite in the submucous tissue. Under all circumstances, tracheotomy is to be preferred to laryngotomy; though the latter, it is true, is much more simple. There is but slight risk of any vessel, likely to cause trouble, traversing the crico-thyroid membrane, and this structure can be divided, together with the superimposed skin, at once, and without dissection or precaution of any kind. The proper point must be fixed upon, and the opening made where it is intended. For it has happened that a perforation has been formed

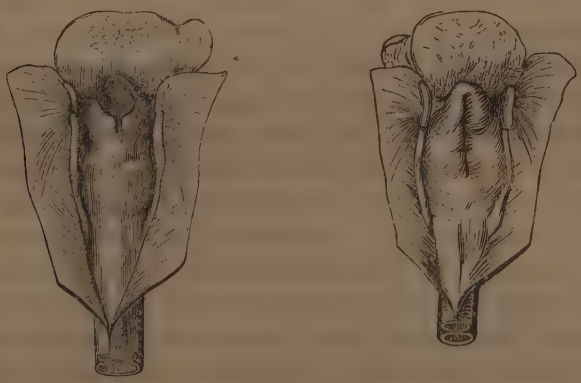
higher up still, quite above the obstruction,—into the mouth, in fact, betwixt the thyroid cartilage and os hyoides. Sufficient room cannot be well made in the crico-thyroid membrane for examination of the site, or for removal of a foreign body; and in operating for disease, this opening falls in the middle of it. A very beautiful specimen of the effects of cynanche laryngea in the adult is preserved in the museum of the Edinburgh University, with an opening in the crico-thyroid space, and in the middle of the false membrane. The operation was undertaken late in the disease, when the patient was in articulo mortis, and when, in all probability, it could have served no purpose, even had it been better planned. From an inspection of the preparation, it is plain enough that laryngotomy, at least, could have afforded no chance whatever to the patient, under any circumstances.

In chronic disease of the larynx, and even in some stages of ulceration of the membrane and cartilages, (laryngeal phthisis,) when the mischief is still confined to this part, advantage may be derived from opening the trachea. In well-marked cases this step may sometimes be adopted, with a view of setting the parts at rest, and of affording an opportunity to make applications more readily to the affected surface. Constant irritability, cough, expectoration streaked with pus and blood, noisy laryngeal respiration, pain referred to the part and increased on pressure, loss of voice, difficulty in swallowing, inability to undergo fatigue and exertion, emaciation, and hectic, will lead to a strong suspicion of ulceration, to some extent, about the rima glottidis. Its existence can often be ascertained by passing the finger deeply in the fauces; the edges and under surface of the epiglottis, which is often much affected, can thus be felt, as well as the opening into the glottis. The symptoms vary according to the progress of the disease, and the extent of ulceration in various parts. The partial destruction of the epiglottis, of the membrane covering the arytenoid cartilages, or of the extremity of one of these, so as to render occlusion of the aperture into the larynx imperfect, gives rise to great irritability of the parts, with coughing on an attempt to swallow liquids. It becomes next to impossible for the patient to receive the

least quantity of liquid nourishment, when the destruction of these parts has proceeded far. Again, when inflammatory œdema has supervened, as it often does, upon these ulcerations, or others in the neighbourhood, in consequence of sudden suppression of discharge from the parts—from imprudent exposure to cold or moist atmosphere, or from injudicious treatment,—the patient is incapable of swallowing solid food, the submucous tissue of the epiglottis and rima, and more especially that covering the body of the cricoid cartilage, being infiltrated to a great extent. Occasionally, the circumstances are such as almost entirely to preclude the possibility of taking nourishment in any form. The existence of this swelling can often be ascertained by a careful examination with the finger; and a view of the parts may sometimes be obtained by means of the speculum,—such a glass as is used by dentists on a long stalk, previously dipped in hot water, introduced with its reflecting surface downwards, and carried well into the fauces. Occasionally, however, the œdema is limited to the cavity of the larynx, to the submucous tissue in the vicinity of the vocal chords. Of this I possess one very beautiful specimen. The lungs are too frequently involved in disease at the same time. The two diseases may go on from the first *pari passu*, acting and reacting on each other; or the affection of the chest may result from that of the larynx, and may be the consequence of the constant and violent succession. The less severe cases may be managed by the free and occasional application of the nitrate of silver in solution,—by means of a piece of lint or sponge well soaked in it,—by the establishment of discharge from the vicinity, and by attention to and improvement of the general health. The disease, when extensive, and of long standing, is very unmanageable; and should the ordinary means fail, tracheotomy may, as a last remedy, be resorted to—the lungs having, by careful examination, been ascertained to be tolerably healthy. Applications may thus be made to the ulcerated parts that cannot be reached from above; the secretions are also got rid of with less exertion, and the cough abates in a great measure. The patient can arrange to force out the air, through the artificial opening, in such a way as to carry the discharges with it, and without

much exertion of the lungs. Here, as in all other cases, where the windpipe is opened either intentionally or accidentally, the adaptation of the respirator, or some substitute for it, will be found indispensable.

When swelling comes on in any stage of the disease, and whatever may have been the previous circumstances, recourse must often be had to tracheotomy, in order to prevent a speedy and suddenly fatal termination. The œdema of the glottis may result from inflammatory action originally of the part, or which has spread to it from the neighbouring surfaces. It is either acute or chronic; and it often supervenes upon inflammation or ulceration of the velum, fauces, or tongue, from continued irritation in the posterior alveoli and gums, and from faulty or deranged molar or wisdom teeth. Not unfrequently an affection of the fauces, attended by œdema, follows erysipelas of the face. Some of the symptoms may be simulated by tumour at the bifurcation of the trachea, which, by its size, interferes with respiration, rendering the inspirations long and difficult; and also impedes deglutition, preventing solids from passing readily. The nature of œdema glottidis, and its probable consequences, will be best understood by reference to the accompanying sketches. The first represents the rima of its natural size, with



the parts all in a healthy condition, and is introduced for the sake of comparison with the other, in which infiltration of the

submucous tissue to an uncommon extent has occurred, narrowing the opening, and reducing it actually to a mere fissure or chink. In this case the termination was very sudden. The patient, a young man, had been under my care in the hospital, on account of deeply-ulcerated tonsils, for which he had been previously treated with mercury; in a few weeks he recovered from these sores by abstraction of the local cause, occasional application of the nitrate of silver, and the use of sarsaparilla. He was dismissed with a mere abrasion on one side of the fauces; but, about ten days afterwards I was requested to examine his body. He had led a dissolute life after he went home; had used stimulants freely, and had been out for some nights very late, the weather being at the time unfavorable. He had complained for two days of sore throat, with cough and some difficulty in breathing and swallowing, and had staid at home in consequence; no advice was sought; in the evening he was sitting by the fire smoking his pipe, when suddenly he started on his feet, rushed to the door, and fell down in a state of asphyxia; a practitioner came, and, as is too common in cases of injury or sudden seizure of any kind—no matter what—tried to bleed him;—he was dead. Every part was sound excepting the fauces, which had again become slightly ulcerated; and the larynx was found as represented in the sketch. It is preserved, as one of a very extensive series of pathological specimens of this organ, in my private collection, which is readily accessible at all times to the pupils and profession.

The accumulation of serosity in the subcutaneous tissue of this important part, is attended with laborious inspiration, increase of secretion from the surface, difficult expectoration, and cough. The expiration is comparatively free and unembarrassed; as the rima becomes narrowed, the inspirations are rendered more and more noisy and rare, and are accomplished with a great effort, and very imperfectly. All the muscles which expand the chest are called into powerful use; and the shoulders are raised and fixed, in order that some of these muscles may act with greater effect. Fits of threatened suffocation come on from time to time, more especially when the patient

has been thrown off his guard, and the viscid and tenacious mucosity has been allowed to accumulate in the trachea and larynx—as, after he has been a short time asleep. In the more severe cases the patient dare not trust himself to take the slightest repose, and remains in the erect position, wakeful. Suffocation often occurs very suddenly; the patient starts up, supposing that he is drowning or suspended by the neck, utters an exclamation, grasps at some object, and sinks down insensible, with a total suspension of breathing. This happens occasionally, from the same cause, in the advanced stages of wound of the throat, when the treatment has not been carefully looked to, and when the accession of urgent symptoms has been disregarded. From the swelling of the epiglottis causing it to remain in an erect position, as well as from the general engorgement of the parts, the passage of solid food is difficult; and even liquids must be taken with caution, lest any drops should pass into the glottis, which cannot be accurately closed as in its natural condition. In order to relieve the urgent symptoms, and prevent an untoward termination of the case, it will often be necessary to resort to operative procedure; efforts may have failed to relieve the symptoms by general means, emetics, demulcents, expectorants, antispasmodics, &c.; these are not much to be depended upon, at all events after a certain period, and the practitioner who would persist in their use to the prejudice of the patient—who would thereby endeavour to lull him into a fatal security after urgent symptoms have arisen—will have himself much to blame. The cause of danger has been explained; it is mechanical, and spasm has little or nothing to do in the matter. The swelling, when it affects the epiglottis and rima to any extent, can be distinctly felt; and this will, if need be, confirm the diagnosis. Local means are of little avail in arresting the symptoms or removing the swelling; it may be punctured, and counter irritation may be used in all ways on the side of the neck, but dependence is not to be placed on these means much more than on the general treatment. In every affection of the larynx, it should be kept in view, that in spite of all measures the symptoms are likely to be aggravated, and the case to become urgent; and, accordingly, the possibility of

its being requisite to make incisions on the fore part of the neck must be considered. The discharge of counter irritation should be excited from the sides of the neck, not from the fore and upper part over the box of the larynx. I have more than once been called upon to perform tracheotomy in cases which had been under treatment for some time, and accordingly, blisters and antimonial ointment had been again and again applied over the whole fore part of the neck; the consequence was great thickening and condensation of the skin, and of the cellular tissue down to the tube. The incisions were made with difficulty, their depth was much greater than usual, and from the matting of parts it was impossible to see or feel what was being cut,—as is the case in the natural condition of these structures:—consequently it would have been difficult to avoid parts of importance, such as the inferior thyroid artery, if pursuing an irregular course. Recourse to tracheotomy is more frequently demanded on account of œdema glottidis than any other circumstance, and the operation, when thus undertaken, is generally attended with a happy result. The diseases of the larynx are exceedingly prevalent in the northern metropolis, and there I must have performed the operation nearly twenty times, with almost uniform success, for chronic swelling, causing urgent and threatening symptoms as above described. The steps of the operation are not varied, in any respect, from those detailed in treating of the extraction of foreign bodies; but, in addition, means must be taken to keep the wound patent. It has been proposed to remove an oval portion of the tube; this is a difficult matter, does not serve the purpose long, and is apt to be followed, after healing of the wound, by inconvenient and dangerous narrowing of the trachea. An instrument like a small dissecting-forceps has been used, by the separation of whose blades, through their elasticity or otherwise, the edges of the opening in the rings have been kept apart: but this contrivance is inefficient, and not to be depended upon. The proper plan is to insert such a tube as that represented p. 413, curved and of the necessary size; many of those sold for the purpose are much too small and straight. After a few minutes all irritation from its presence ceases. This tube, of a conical shape and flattened

laterally, answers best in the first instance; the edges of the incision are compressed by it, and oozing prevented; the vitiated mucus can be easily removed by the nurse or asssistant by means of a feather, or by a curved probe with a bit of lint fixed in the eye, and wrapped round it. After a time the patient can attend to all this himself; he can remove his tube, clean it out, and replace it. In a few days, a smaller one, of the same calibre throughout, may be substituted; it may be made double if the practitioner fancies it more convenient or safe, and perhaps it is so in young subjects; and directions may be given to withdraw the inner one, if suffocation should be threatened from accumulation of mucosity. I never saw any use for such a contrivance in adults, as in a few days the tube can be taken out and replaced without pain or trouble, and the breathing is carried on meanwhile quite easily through the wound. The patient clears the large tube by narrowing its orifice with his finger; and he will be able, without resorting to this manœuvre, to cough readily through the small and narrow one.

The time during which it may be necessary to preserve the artificial opening, will depend upon the state of parts which rendered its formation necessary; it may vary from a few days to as many weeks. It may be found that, though the patient breathes freely for a time after the closure of the wound, the embarrassment and alarm recur during sleep. Some patients, in consequence, cannot or will not dispense with the use of a small tube; and many have worn one for a series of years, the respiration being carried on partly through this, and partly by the natural passage. The voice, of course, is imperfect under such circumstances, the patient speaks in a whisper, but by closing his tube he can articulate distinctly enough.

An artificial opening of the windpipe is not at all necessary in order to inflate the lungs in cases of suspended animation; a curved tube can be readily introduced for this purpose through the natural passage. The tongue is brought forward, and the instrument guided on the finger in the mouth, or it may be passed through the nostril. But perhaps the lungs may be inflated as well, and with less trouble, without recourse being had to any such proceeding.

INJURIES AND DISEASES OF THE RECTUM AND ANUS.

The extremity of the intestinal canal is sometimes injured from without. I have had occasion to treat a good many penetrating wounds of the hip involving the bowel; several in which the foreign body entered the anus, producing lesion of the coats of the bowels; and some also in which the viscera in the vicinity, the bladder, and vagina, were implicated. Small pointed bodies, as pins, occasionally penetrate and lodge in children. These wounds and injuries must be treated on ordinary and common-sense surgical principles, great trust being put in the efforts of nature. It may be necessary, at some stage of the case, to divide the sphincter of the anus, on one or both sides, in order to promote the healing of a cavity, or the closing of some false passage by putting the parts completely at rest for a time. Foreign bodies of various kinds and sizes,—clyster-pipes, bougies, &c. &c.,—have been introduced from without by either accident or design, so as to lodge and require surgical interference for their extraction; this may be effected, in general, without much difficulty, by the use of forceps or a lithotomy-scoop guided on the finger. A number of such cases are scattered through the records of surgery, and a very ample collection of them is made by Morand, in the third volume of the "Memoirs of the French Academy of Surgery." The case which occurred to Marechal, in which a pig's tail was introduced into the rectum of a woman of the town by some medical students, whom she had somehow offended, will be read with interest. The trick had been most maturely planned; the tail was prepared for the purpose, the bristles being cut short, and was introduced with the thick end uppermost; the consequence was, that any attempt to remove it gave rise to the most excruciating pain; the rectum became inflamed, and the bowels obstructed: it was necessary to interfere, and this the surgeon did very cleverly: having secured a strong cord to the apex of the queue, he introduced a hollow tube—a piece of reed well rounded at the end—over the foreign body, and removed both together without pain or difficulty.

Hard-pointed and irregular substances sometimes pass along the whole course of the alimentary canal, and are at length arrested at its extremity; they are entangled in the coats of the bowel, and give rise to great uneasiness; or they may penetrate the parietes and lodge in the cellular tissue, causing inflammation, abscess, or even sloughing. Bones of small animals, rabbits, hares, fowls, are now and then detected in the rectum and extracted. I have removed from this situation half the jaw of a rabbit, which had been swallowed in a plate of curry. Pins, small fish-bones, or small spiculæ of large ones, after passing so far and becoming retained, are apt to penetrate the coats of the bowel; the symptoms being not at first severe, their presence is not ascertained; but their lodgment in the cellular tissue outside is soon manifested by painful swelling. The progress of the tumour to suppuration is the same as in those arising from other causes, and the consequences must also be similar.

Many attempts have been made to mystify the subject of diseases in this region, and to separate them, in a great measure, from general surgery. But there is no such difficulty as has been supposed in understanding their nature; the principles which should guide their management are simple, and the means, operative and otherwise, are easily enough applied. The cause having been observed or removed, local measures can be adopted with a certain prospect of benefit in the majority of cases. Congestion and swelling of the lower bowel, hæmorrhoids, and condylomata, prolapsus of the lining membrane, inflammatory swelling, acute or chronic abscess—and its almost uniform result, fistula in ano—are all traceable either to a disordered state of the chylopoietic and assistant viscera, or to enlargement or irritation of some kind in the genito-urinary organs of either sex. Evacuation of the alimentary canal, amendment of the state of the lining membrane, and correction of the secretions from its surface, by suitable medicines, by lavements, and by a well-regulated system of diet, will, in many cases, do much towards a cure; above all, hepatic derangements must not be overlooked. In other cases, attention must also be given to the pelvic viscera. Whatever keeps up irritation, interferes with healthy functions, or obstructs in any way the return

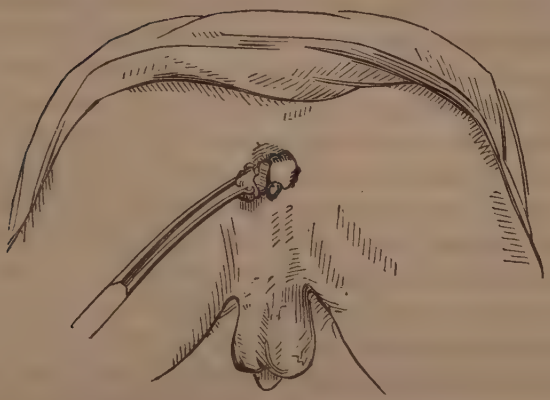
of blood from the parts, should be looked to and obviated as far as possible. Hæmorrhoidal affections accompany, and arise from, pulmonary disease; that such should be the case, and that relief should often attend the consequent discharge, is plain enough; and it is equally clear that there should be little interference in such cases on the part of the surgeon: palliative means may be resorted to, but even if it were possible to put an end to the external disease, it would not be very prudent to do so.

Small and soft hæmorrhoidal swellings,—mere distension of the veins, without much thickening of their coats or surrounding infiltration, may be made to disappear by the use of some astringent, after due attention has been given to the indications already noticed. Solutions of astringent salts, as of alum—or decoctions, as that of valonia, are to be preferred to the filthy and inefficient unguents that are generally prescribed; the application of the former is more simple, and much more effectual. In severe attacks of congestion in the hæmorrhoidal veins, with a certain degree of inflammatory action and great suffering, the recumbent position must be enjoined; blood may be taken away by leeching, and fomentations are assiduously employed with great advantage. In the commencement of an attack of hæmorrhoids, instant relief is afforded by evacuation of the coagulated blood contained in the distended venous branches, and the proceeding is almost unattended by pain; puncture of the tumour is made freely, by the use of a fine lancet or bistoury. Condylomata, hard white piles,—consisting generally of coagulated blood, thickened vein, and extensive vascular and infiltrated tissue,—will disappear after a time, by a persistence in constitutional treatment, proper regulation of the functions of the digestive organs, and the use of astringents. Frequent ablution must be resorted to; and if there is much discharge as from fissures and abrasions, a free application of the nitrate of silver will often produce a rapid change for the better. Condylomata, if very troublesome and of long standing, and not promising to yield readily to general and local means, may be removed by operation with perfect safety. It is often advisable to resort to this step, when their presence gives rise to irrita-

bility of the bowel, or of neighbouring viscera, such as the bladder or uterus, causing obstruction to the evacuations, with straining, and consequent eversion and falling down of the mucous lining of the rectum. In prolapsus recti, to which the patient has been long subject, the lining membrane, to the extent of an inch or two, is rendered insensible, changes its appearance from exposure and contact with external substances, and approaches in structure to the common integument. It is this part which forms the outer surface of the tumour when extruded; but besides, folds of the unchanged mucous membrane, of a dark red colour, present in the centre, with its vessels gorged and distended almost to bursting. In many cases the vessels give way, and furnish, either constantly or periodically, considerable quantities of blood, from one or many points. It is only, however, when the parts are thus displaced and compressed, that bleeding does take place. Some portion of the lining membrane remains always protruded in bad cases, forming a fold round the anus, and involving the condylomatous tumours. The sphincter of the bowel acts imperfectly, in consequence; it remains over-distended, as it were, by the morbid mass which it embraces, and thus loses its tone.

The operation for prolapsus is confined to the external parts, and can be effected by cutting-instruments, with perfect safety, and with comparatively little pain. The removal of internal piles, as they are called, or of folds of the mucous membrane whose veins are congested, is often resorted to very unnecessarily; and the tying off of piles has been of late years rather a fashionable remedy in this city, as was at one time, in Paris, the cutting for fistula amongst the retainers of a profligate court. When the lining membrane of the bowel is kept in its place, and when there is no obstacle above to prevent the return of the circulating fluid, its vessels are not over-distended, and do not give way so as to furnish blood; and any morbid thickening that may exist will soon disappear, for there is seldom any internal tumour deserving the name of pile. Occasionally thickening does take place of that part of the bowel which has been subject to protrusion, and adventitious formations are sometimes met with on the surface of that portion of the membrane which

forms the centre of the prolapsus. Sometimes also these internal piles, as they are called, are of so large a size that evacuation of the bowels cannot take place unless they are previously displaced and protruded. These ought certainly to be removed, either by single or double ligature. The base of the mass should be transfixed with a proper needle, (that represented in p. 336 is the best,) a strong ligature is tied round it and the included mass, and the needle is then withdrawn; or this is armed either before or after being passed, the portions of the ligature separated, and one tied on each side. This is often done on comparatively sound mucous membrane, with a view, it is said, of producing firm adhesions to the subjacent parts,—a very unnatural condition of parts; in nineteen cases out of twenty, the proceeding is as hurtful as it is uncalled for. If any mass is to be removed from within the sphincter, the only safe method of doing so is certainly by ligature, hæmorrhage being almost sure to follow any other means to a dangerous extent, as noticed in Chapter I., p. 22. The proper operation for prolapsus consists in removal of the condylomata, along with a portion of the loose fold that surrounds the verge of the anus, as recommended by our distinguished countrymen, William Hey and John Abernethy; its object is to remove the irritation occasioned by the external tumour, and to permit the sphincter to act freely and without restraint, so that it may recover its due contractility, and cause, by cicatrization of the incisions around the opening, a condensation and farther contraction of the orifice. The condylomata are taken up by a hook or small vulsellum, and cut away with a pair of long and strong scissors; or the object may be effected with much less pain and as quickly by the use of a probe-pointed straight bistoury, which can safely enough be applied if the patient's steadiness can be depended on. A fold of the relaxed, altered, and protruded membrane is taken up on each side of the orifice, and an oval portion cut out, the axis of which corresponds to the direction of the bowel. A vulsellum, with the hooked teeth parallel to the handles, as here shown, will be found most suitable for the purpose of raising the part to be removed. Polypous tumours of the rectum, of which I have met with several cases at all periods of life, must



be removed by ligature. Many years ago, I had to encounter one fully the size of the fist, in the person of an old female. It adhered by a comparatively narrow pedicle; and was noosed in the same way as a polypus of the vagina, with a favorable result.

Abscess near the verge of the anus must be opened without delay, so soon as discovered; whether acute or chronic, and from whatsoever cause it may originate,—from external injury, lodgment of foreign body, congestion, inflammation following an attack of hæmorrhoids, exposure to cold, constipation, or deranged bowels or liver. Fluctuation and pointing are not to be waited for, as indications of matter having formed, in this situation. The history of the case, the deep-seated pain and hardness on one side of the bowel, with perhaps slight projection and dark discoloration of the surface, will warrant recourse to incision. In many cases the progress of the case is slow and relief of all the symptoms may have been felt upon the discharge of some matter by stool. But, again, a fresh accession of swelling and of pain occurs, aggravated by pressure or action of the muscles of the part. The opening should be made very free, an inch or more in length at least, according to the size of the tumour, and of the same extent in the cyst as in the external covering. By proceeding thus at an early period of the case, there is a chance of the cavity contracting and healing up permanently; and I have met with no inconsiderable number of

cases in which this favorable result has taken place. But, in other cases, the cavity, though contracting generally to some extent, continues to discharge pretty copiously; and this is not unfrequently to be ascribed to delay in making an opening, leeches and cold lotions having been persisted in long after matter had formed. This may also arise in consequence of the unfavorable situation of the abscess, or the imperfect and difficult return of blood from the diseased parts, more especially if the alimentary canal, or any of the pelvic viscera, are at the same time disordered. Also the weak vitality of the fatty matter in which the abscess is situated, and the frequent action of the levator ani in all the evacuations of the bowel and bladder, by which the sides of the cavity are disturbed and prevented from coming together, may form impediments to its closure. The persistence of discharge may also, in a great many cases, be the consequence of communication existing between the suppurating cavity and the bowel, through which the flattus and fluid fæces enter the cavity, and there maintain a constant irritation.

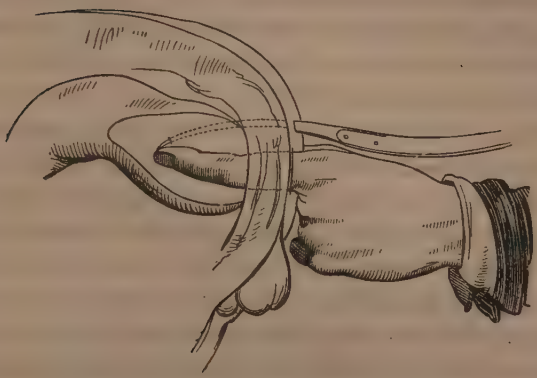
A fistula is thus established; it may consist of one sinus more or less narrow and extensive, proceeding from an opening betwixt the verge of the anus and the point of the hip, towards and along the coats of the bowel—the blind external form; or there may be a communication established with the rectum, somewhere above the sphincter—the complete form. More openings than one may exist in the integument, and there may be a good deal of hardness around. Several tracks may communicate with the principal one, from the buttock or perineum, the result either of the original abscess, which has been permitted to attain a great size, or of subsequent collections. Again the parts may become tranquil upon the spontaneous escape of matter into the bowel; the uneasiness may have, in a great measure, ceased, and the swelling may have almost entirely disappeared; the discharge, however, still continues in greater or less quantity, and alarms the patient. By careful examination an opening is discovered internally, and a corresponding hardness may often be perceived by pressing the finger deeply by the side of the bowel. The patient will generally be able to give information, which will guide the surgeon with tolerable

accuracy to the affected part. With some care, a probe may even be turned from the opening in the bowel, so that its point shall be felt externally, and used as a guide in further proceedings for the cure; this is the blind internal form of the disease. The principle of treatment is the same in all cases of fistula.

In the operation recommended for aggravated piles and prolapsus, the object was to produce permanent contraction, and enable the sphincter muscle to perform its functions with freedom. Here, on the contrary, the object of the surgeon is to widen the outlet for a time, and incapacitate the sphincter from acting at all; with the view of favoring the contraction and consolidation of suppurating tracks, of putting ulcers and fissures about the anus in a condition to assume a healthy action, and of removing irritability and painful contraction of the orifice of the bowel. The evacuations then take place without effort, and it must be admitted that this is rather an uncomfortable state for the patient. The power of retention is, however, gradually recovered; and before that takes place, if the treatment is otherwise well conducted, the uneasy feelings disappear, the sores heal, and the discharge dries up. The patient must be made aware that a remote and very hopeless prospect of cure, if any, can be held out, unless by the aid of an operation neither severe nor dangerous; and should he agree to submit, he must be properly prepared for it. The digestive organs, if not before put in good order, must now be attended to, and their secretions corrected. Previously to all operations on these parts, the bowels should be well cleared out, so that it may be possible, by the exhibition of opiates from time to time, to prevent their acting for several days. Much pain is thus avoided, and the dressings are not disturbed until discharge is established; then some mild purgative is given, and its action facilitated by the injection of warm oil or gruel. These precautions are equally, if not more necessary, in the operation above described for prolapsus recti. The patient is by far most conveniently placed, kneeling upon a chair,—in all operations at the extremity of the bowel, the knees on the seat, the elbows resting on the back. He may prefer to stand by the side of a table or bed, and lean over it, in which case care must be taken that he does

not raise his heels from the floor, or bend his knees; the nates are fully separated and kept asunder by a good assistant. The operation is proceeded with differently according to circumstances. In the complete fistula, the extent of the track and the existence of an internal opening will be ascertained by previous examination, with a probe in the sinus, and the finger in the bowel. A narrow, slightly curved, and blunt-pointed bistoury is then substituted for the probe; and its point is made to meet the finger through the natural opening—or higher up, if the coats of the bowel are extensively detached. There is no difficulty in dealing with either a complete or blind external fistula, by passing a bistoury, with a properly made point, through the coats of the intestine; and these are usually softened and thinned to some extent. The knife and point of the finger having been placed in contact, they are withdrawn together, and some little art is requisite in effecting this; the blunt part of the instrument is placed in contact with the finger, by raising its handle, at the same time that the distal phalanx is bent as much as possible. The points of the fingers and of the bistoury are then gradually brought down to the verge; and a sawing motion is given, in order to divide the interposed part. The point having fairly emerged, the handle is quickly pushed towards the opening of the fistula; and, at one sweep, the sphincter, bowel, and integument betwixt the finger and knife are divided. The blind internal fistula having been discovered, is made complete by pushing a sharp-pointed bistoury into the hard swelling felt by the side of the anus, or upon the point of a probe introduced as above described; the division is then completed upon the finger by the narrow blunt-pointed knife.

Notwithstanding the most careful and dexterous management of the knife, there is a risk of the instrument breaking, when the parts have been much condensed; or this may happen, in any case, from the unsteadiness of the patient or imperfection of the instrument. The accident has occurred twice in my hands; once from a flaw in the blade of the bistoury, in the other case from the almost gristly state of the parts, the hip traversed by numerous fistulæ, some of more than twenty years standing. I had provided, in this case, for the accident which I dreaded,



by having a second and stronger knife open and at hand; the broken portion was picked out of the wound by the fingers, after the division had been completed. It will be always prudent for the surgeon to have at least two probe-pointed bistouries within reach, in operating on difficult cases. And he should endeavour, by all means, to acquire the power and facility of performing this operation with the left hand as well as with the right. If he cannot do so, he must, in operating on the left side, either cross his hands very awkwardly, or else place the patient on his back on a table, and have him or her held in the position as for lithotomy; and this will not always be submitted to. The gorgets, guards, directors, concealed and sliding knives, are now, it is to be hoped, entirely and for ever thrown aside; the operation can be completed more safely and quickly by the simple method and instrument above described, and long since recommended by Percivall Pott, than by any other plan. When the operation has been completed, means are taken to prevent the coalescence and union of the recently divided surfaces. A slip of lint, dipped in tepid water, is carefully insinuated with the probe, the finger being placed in the bowel to insure its proper position; and this is retained by a compress and T bandage. The outer dressings may be removed within twenty-four hours along with the bandage, and replaced by fresh ones. But the immediate dressing is retained until suppuration is established. On the evening of the second or third day, some

medicine may be given; and the lint escapes with the evacuation from the bowels. Adhesion cannot then take place, and it is only after the discharge has somewhat ceased, when the circulation of the edges is very active, and the granulations florid and firm, that there is a chance of union of any part of the surface. This is prevented from occurring inopportunely by occasional examination of the wound, and separation of it with the finger or probe; no dressing, after the first, need be interposed betwixt the divided parts, if that have been perfectly applied, and retained for a sufficient period. Frequent ablution, for the sake of cleanliness and to obviate excoriation, must be resorted to, and some slightly astringent and aromatic lotion may be used occasionally; or if the discharge be profuse, a piece of lint soaked in the lotion can be applied and frequently renewed. The cure will thus be completed successfully, and with less trouble and pain than by following the ordinary and old-fashioned method of dressing day after day with this and the other digestive or stimulating salve.

It may be deemed necessary—and in many cases a cure cannot otherwise be expected to take place—to divide the sphincter ani, in order to put the parts at rest, and thus effect the healing of troublesome fissures on the verge, or of ulcer within it. And the operation may also be resorted to, with the view of facilitating the contraction of some false passages, as that betwixt the bowel and vagina, in recto-vesical fistula, or in order to get rid of painful contraction and excessive irritability—a sort of neuralgia of the anus, of which I have thus effected some excellent cures. This division can be made easily and without danger; it may be done on one or both sides; the fore-finger is introduced in the bowel, and upon it a straight, narrow, and blunt-pointed knife is slid with its side towards the finger; the edge is then turned to the tuberosity of the ischium, and division made to a sufficient depth through all the resisting fibres. The incision in the mesial line forwards might be attended by dangerous and troublesome consequences, if carried to any extent, in either sex; that in the opposite direction would not be so, but by neither can the desired object be gained, as the fibres would thus be merely separated, not divided.

Permanent induration with narrowing of the rectum is occasioned by long-continued irritation at the extremity of the bowel, with straining to evacuate its contents, by injury inflicted in its coats by the passage or lodgment of indurated feculent matter or foreign bodies; by injury during parturition; and by inflammation, in any way produced, extending from the vagina. This contraction is generally met with in the lower natural fold of the bowel, about four inches from the verge of the anus; it varies in extent and tightness; and the size of the stools, and the difficulty of expelling them, of course in some measure keep pace with the degree of stricture. The passage is widened above, and its secretions are increased and vitiated.

Abscess not unfrequently forms by the side of the contraction, opening into the bowel above, and occasionally it makes its way to the external surface also; a complete fistula is thus formed, leading to the dilated part. It resembles urinary fistula, and arises much in the same way, from ulceration in the dilated part, or from induration in the submucous cellular tissue, followed by the suppurative process, and caused by constant impulse upon the part affected. The functions of the entire alimentary canal become deranged, and the patient is wasted by that, and by the constant irritation and discharge. Blood is often lost from the hæmorrhoidal vessels during the straining, and this contributes to exhaust and diminish the powers of life.

Not unfrequently, the coats of the bowel are the seat of malignant induration; the surface becomes nodulated, irregular and very hard; and from the fissures separating the tubercles, a profuse sanious and most offensive discharge is furnished. The same symptoms accompany the contraction from this cause, but the progress of the case, to an unfavorable termination, is more rapid, and the sufferings of the patient are more distressing in every respect. Collections of matter form; ulceration proceeds often at a rapid rate, and destroys the partition betwixt the bowel and the neighbouring canals. No hope of cure can be held out to the sufferer, and efforts at even temporary relief and palliation too frequently fall short of the expectations that are entertained of them.

The extremity of the bowel, affected by malignant disease, and also, it appears, in cases mistaken for this affection, has sometimes been made the subject of severe and bloody proceedings. When operations for malignant disease on the surface can be undertaken very rarely indeed with any prospect of success, what is be expected from such proceedings upon parts, where neither the extent of the actual disease nor the condition of the lymphatics can possibly be ascertained? Such interference is in good keeping with that which has been most unwarrantably had recourse to in some diseases of the uterus and its appendages, and is equally to be reprobated and discouraged.

Contractions are, though very rarely, met with betwixt the commencement of the intestinum rectum and termination of the sigmoid flexure of the colon. It has been, and still is, the aim and anxious desire of a certain class of practitioners to make it appear that such contractions are of common occurrence, that their existence is readily ascertained, and that they are removable by surgical means. All derangements of the alimentary canal are by these disreputable persons attributed to strictures, said to exist in the situation indicated. Vitiated secretions, mucous or purulent, from the large intestine, the sequelæ of dysentery—disease of long standing in its lining membrane, anyhow induced—and accumulations of feculent matter, or of flatulence, the consequence of indigestion from improper diet, and of deranged state of the whole mucous membrane of the alimentary canal—are alike referred to, and treated as the results of morbid alteration, at this particularly convenient spot. Instruments are forthwith introduced,—such as probangs and ball-probes of silver, ivory, or ebony,—and these are followed in regular order by bougies of all sorts, sizes, and longitude. Instruments have even been, it is said, passed nearly three feet, certainly more than two, into the bowels, in some of these explorations in search of organic disease; whether they were jointed or not, like the machine for sweeping chimneys, is not stated in the writings of the rectum doctors.

It is no easy matter, certainly no very pleasant duty at all events, to pass an instrument into the sigmoid flexure of the

colon; the natural obstacles are considerable; the direction of the tube, the laxness of its coats, its natural folds, and the relative position of the sacrum, are all opposed to the proceeding. The resistance offered by any or all of these is easily mistaken by the patient, or misrepresented by the doctor, as unnatural; and a most cruel and abominable practice is accordingly adopted, and sometimes persevered in for an indefinite period, with the effect of embittering life, and ultimately inducing, in many cases, serious and dangerous changes of structure, where none had previously existed. The simple stricture of the rectum, which is within reach, and about which there can be no mistake, yields readily to the introduction, at proper intervals, of short bougies of India rubber. These are gradually increased in size, so as to bring the canal somewhat to its natural calibre; and it is kept in this state by the occasional introduction of an instrument by the patient himself. The bougie is more conveniently retained, when it is of such a form and length as to be received entirely within the sphincter; and there is no occasion for its being worn for more than a few minutes at a time. In complicated cases the knife must be resorted to; any tracks connected with the stricture must be divided, as already described in treating of fistula; and occasionally the stricture has been made to yield to the pressure of the bougie more quickly, by previously notching its sharp edge with a narrow straight knife. Urgent symptoms have been thus relieved, and the cure accelerated.

CHAPTER XII.

INJURIES AND DISEASES OF THE GENITO-URINARY ORGANS.

The prepuce is often in fault, from its inordinate length and the tightness of its orifice; the elongation is frequently a consequence of the constriction, which is sometimes so great as even to present a serious obstacle to the flow of urine. Other annoyances arise from this condition of parts,—phymosis, as it is termed; accumulations of secretion from the surface of the glans and prepuce take place, and these become acrimonious; inflammation arises, followed by puriform discharge from time to time, so establishing a spurious gonorrhœa; the surface is apt to become ulcerated, and, in advanced life, these ulcerations not unfrequently assume a malignant action; as in other situations, the ulcers may sometimes be induced to cicatrize, but the lymphatic system becomes contaminated, and the patient perishes at no distant period. When the orifice of the prepuce is constricted only to a certain extent, it may by an effort of some kind be brought behind the glans. From this change in the relation of parts, great pain and swelling of the organ ensue, with discoloration of the glans, and infiltration into the loose cellular tissue under the lining membrane, which is now anterior

to the stricture; in other words, the infiltration is into the displaced surface of the prepuce, and under the integument which is behind it; two large rounded masses are thus formed, with a deep indentation between them. This displacement is frequently met with even in boys, and causes great alarm on account of the swelling and distension of the organ. These affections—phymosis and paraphymosis,—are often met with in conjunction with venereal disease. The orifice of the prepuce, perhaps lax in its natural state, becomes contracted in consequence of inflammatory œdema, caused by the mismanagement of sores or discharges; or the orifice may have been ulcerated; and, by the contraction attendant upon cicatrization, it is more or less closed. Great inconvenience arises from phymosis when sores exist, and occasionally the patient gets into a much worse predicament by uncovering the glans, and permitting it to remain in that state for a short time; rapid swelling ensues from the obstruction to the venous circulation; the glans assumes a dark appearance, and the breaches of surface are widened by phagedenic action or sloughing. Great part, or even the whole, of this most important part of the organ may thus be lost. The congenital phymosis, if not very complete, may be amended by a little attention on the part of the patient,—by frequent retraction of the membrane, and gradual dilatation of its orifice, not forgetting careful ablution. When there is abundant secretion of matter from the surface and from sores, the employment of a syringe must be recommended, by which slightly astringent tepid lotions should be frequently applied. In the state of inflammatory œdema, suspension of the organ, and even confinement to the recumbent position, with active constitutional treatment, must be enjoined.

When the contraction, whether connate or accidental, is very obstinate, when it is an object to expose ulcers or warty excrescences situated underneath, or when the inflammation runs very high, with great swelling, and threatens to terminate unfa-

vorably, or when it is desirable to permit discharge to escape, and to make direct applications to diseased parts,—it will be proper and necessary to make an incision through the covering; this is resorted to, so that the glans may, at all times, be readily uncovered. Also, it is often called for in order to put a stop to the progress of sloughing. When the parts are unaffected by swelling, the skin moving freely on the subjacent membrane, and if it be nevertheless judged right to widen the orifice by incision, the prepuce should be slightly stretched, and, the object being to divide its two layers as nearly as possible to the same extent, care should be taken that the skin is not unusually elongated. A director with an open end, previously dipped in oil, is then inserted betwixt the prepuce and glans, close by the side of the frænum. The end of this instrument is felt at the reflexion of the membrane, and a sharp-pointed bistoury, narrow and curved, is slid along the groove and passed through to the surface. By one sweep, after the blade has been freely pushed home, the division is made; but, before doing so, the operator must be certain that the guide to the knife is not in the urethra, instead of the preputial cavity, a very serious mistake, and one which I believe has actually been made. A point of interrupted suture is inserted by a small needle, on each side, through the skin and lining membrane, in order to prevent their separation, and thus expedite the cure. These are removed in thirty or forty hours, and the tepid water-dressing applied; the organ being suspended, to favour the return of blood, and prevent œdematous or inflammatory swelling. The incision is made in the same direction, with the same instrument, and in the same manner in all respects, in the other forms of phymosis. This method is preferable to any other, in so far as the division required to effect the object is shorter, and the glans is not afterwards left so unprotected as when the incisions are made on the dorsum, or towards the side of the penis. Independently of the annoyance arising from the glans being always exposed after the operation, the mass of prepuce, left hanging awkwardly on either side, proves troublesome; this last objection, it is true, may be obviated by complete circumcision, but the operation is painful and very severe when practised on the adult, and one to which

many patients would not choose willingly to submit; it is only to be had recourse to in cases of diseased prepuce, or when ulceration has extended so far as to permit the glans to present itself through an opening in its proper covering. There is no necessity for making any suture after the simple incision of the parts, when diseased and infiltrated; for then there will be no undue retraction.

The reduction of paraphymosis is effected without difficulty when the displacement is recent, and when the tissues are still loosely connected. The object is to diminish the bulk of the swelling beyond the stricture, and to bring that, composed as it is of the free edge of the prepuce, forward into its natural position. This is effected by grasping the body of the penis, behind the swelling, with the fingers of one hand, a napkin being interposed; the dorsum of the glans penis, smeared with liniment, is then gently, but uniformly, squeezed with the fingers expanded. After the swollen parts have, in this way, been rendered flaccid, an attempt is made to bring the constricted part forwards over the corona glandis, whilst that body is pushed back through the tight ring of the prepuce. This cannot safely be tried to any extent, however, when the glans is ulcerated extensively. There is a period at which the attempt cannot possibly succeed, when the tissues have become infiltrated and filled with lymphatic deposite, and when the stricture has cut deeply into the swelling, by ulcerative absorption. In all such aggravated cases, it is the best practice to divide the narrow stricture at once: and this is done by separating the two swellings, already spoken of, and passing the point of a small knife deeply between them. The reduction is then accomplished, in the more recent cases, with great ease. In others, though the parts cannot be placed in their normal relations, danger to the glans, from extensive ulceration or sloughing, is thus obviated; suspension of the organ, fomentation, and antighlogistic treatment, will soon bring the irritated parts into a quiet state.

Warts occur not unfrequently on the prepuce and glans; if neglected, they increase to a surprising degree, and present an appearance that may be mistaken for malignant disease; the history of the case will assist the surgeon in making his diagno-

sis. The parts will not present a large ulcerated surface; in some places distinct warts will be detected, and the discharge which takes place occurs from between the fissures of the growths, and not from the whole surface. The disease is not painful, and will exist for a long time without any affection of the lymphatic glands in the neighbourhood; and, on separating the prepuce, the extremity of the glans is frequently found in a healthy state. It is not necessary to remove the prepuce for such an affection; it will be sufficient to snip off the warts with a pair of scissors, and if they have any tendency to reappear, to apply nitrate of silver, or other escharotic, freely to the surface.

Malignant ulcer of the penis differs from the warty excrescence above described, in the mode in which it commences to affect the prepuce and glans, and in its appearance and results. This disease usually occurs in persons affected by congenital phymosis. It is characterised by the great hardness and swelling which surrounds the ulcer, by its constant tendency to spread, and by its resisting all applications for its cure. The discharge is thin and gleety, occasionally sanious and fetid. The lymphatic glands in the neighbourhood become early contaminated, which does not occur in simple warts; and it is only previously to this that any hopes of cure can be held out to the patient. A careful inquiry into the history is of great importance in this disease, and will assist the practitioner very much in forming his diagnosis. Should it be found that the patient is suffering from an ulcer having the characters above described, and that he has not lately been exposed to the contagion of any venereal affection, the delay which the trial of various internal and external remedies occasion, will perhaps deprive him of the only chance he has of effectual cure, that by operation. If the prepuce only is affected, and the ulceration is in its early stage, it will be sufficient to perform the operation of circumcision; but should the ulceration have extended to the glans, amputation of the penis will be the only effectual treatment. While treating of this subject I may mention that an excoriation at the orifice of the prepuce from the constant rubbing of the clothes, and the frequent motion of the prepuce is difficult to heal. A good

mode of treating these sores is to apply nitrate of silver freely, then some dry lint, and cover this with a piece of adhesive plaster; this dressing should be allowed to remain untouched for two days, at the end of which time the sore will frequently be found healed.

Another irritable sore occurs at the orifice of the prepuce, when this is much contracted by the cicatrix after ulceration in this situation. The edges crack, in a longitudinal direction, producing small painful fissures, which will not heal until the prepuce is slit up.

A most formidable disease of the external genitals, but which is of rare occurrence, is called chimney-sweeps' cancer, from being generally found in persons who follow the employment of sweeps. It is supposed that the soot accumulates between the rugæ of the scrotum, and gives rise to the irritation which produces this dangerous disease. It is occasionally found to attack persons who are in no degree exposed to the action of the soot. The disease commences in the form of a small wart situated generally at the lower part of the scrotum, which quickly degenerates into an open malignant ulcer; this extends rapidly, involving the neighbouring skin, and if the disease be allowed to continue, the testicle itself becomes contaminated and involved in the malignant growth. The discharge is thin and fetid, and the sore usually excavated. The lymphatic glands in the groin and lumbar region soon participate in the disease, and then no hope of recovery can be held out to the patient. This species of ulceration resists all escharotic applications, and every known remedy. The best mode of treating it is, in the early stage, the free excision of the disease together with a portion of the surrounding integument, the dissection being carried at the same time deeply. Every part of the scrotum at all in connexion with the malignant ulceration, or that has the slightest appearance of contamination, should be removed. It has occasionally happened that nearly the whole of the scrotum has been dissected off, and the testicles been exposed perfectly bare. This is of little consequence. It is astonishing how completely, and in how short a time, these glands receive a covering at the expense

of the surrounding healthy skin, together with the cicatrix formed by the granulations. In fact, the removal of the whole of the scrotum would be supplied by a very effectual substitute.

The scrotum and coverings of the penis are distended by œdema and watery effusion to a very great extent, when patients suffer from general dropsy. It is very rarely necessary to interfere with such cases, but care should be taken, if the penis be much hidden by the swelling of the integument, to prevent the urine dribbling over the distended part: a most troublesome excoriation might be the consequence.

But the scrotum may become distended by the effusion of fluid, and may require the most active treatment. This disease, called inflammatory œdema, resembles in many of its characters effusion of urine; but, as it requires in some respects a different treatment, the practitioner should be well acquainted with its nature.

This œdema follows on sores or eruptions situated in the groin, genitals, or inside of the thighs and on fistulæ about the perineum and anus. Suddenly, and without any apparent cause, the scrotum begins to swell, and in less than twelve hours will be very much distended; and this effusion is not of mere serum, generally very putrid, alone, but the fibrinous part of the blood appears also extravasated. If this be allowed to distend the scrotum without being interfered with, it will have the same bad effects as the effusion of urine: on inquiry it will be found that there has existed no disease of the urethra, or impediment to the passage of the urine, and a large sized catheter will be put into the bladder without meeting any obstruction. This circumstance, together with the excoriations in the neighbourhood, will lead the practitioner to a true diagnosis. In this disease, the scrotum becomes hot and shining, and the posterior and inferior part soon presents a dark colour, sloughs, and then the whole cellur tissue of scrotum will be found destroyed. This shows the necessity of early and active treatment. A free incision should be made in the mesial line, if the disease be seen in the commencement. If there be reason to expect that the cellular is more extensively destroyed, it may be necessary to

make an incision on each side of the raphe. A poultice may then be applied, and the scrotum well elevated and supported on small pillows. When the sloughs come away, the granulating surface is to be treated in the ordinary way, with water-dressing or zinc lotion. Attention should be paid to the general health. As there is no impediment to the flow of urine, no object would be gained by the introduction of a catheter into the bladder. I had in the Edinburgh Hospital no less than six cases at one time, in a very unhealthy season, and in different stages of their progress. The loss of cellular tissue will depend upon the period at which the case is presented, and the activity and judgment with which the treatment is conducted.

CIRSOCELE.

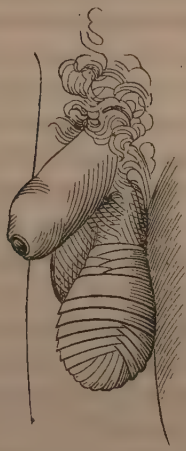
Enlargement, or varix of the veins of the testicle, occurs, called cirsocele, of the same nature as in the veins of the lower extremity; it is more common on the left than the right side, on account, it is said, of the way in which the left spermatic vein empties itself into the left emulgent vein of the kidney, or from the pressure of the sigmoid flexure of the colon. This swelling and enlargement of the testicle is known by its disappearance into the abdomen when pressure is used; by its returning when the cord is firmly grasped between the fingers, and the unevenness of the swelling giving to the hand the sensation of a bag of worms. The disease in its commencement may be combated by giving constant support to the scrotum by means of a bag-truss, and by the application of ice. In its more confirmed stages it produces pain and inconvenience from its weight, and requires more active measures for its removal. The best treatment is that of obliteration of the veins by means of the introduction of two needles, about three quarters of an inch apart, under the veins in the spermatic cord; (the cord being previously pinched up, and the vas deferens separated,) and twisting strong silk over the needles. This plan has been pursued in several instances, and followed by complete success, without exciting any inflammation, and is much less severe than cutting away a portion of the scrotum, as recommended by some surgeons, the only effect of which is to keep up permanent pressure on the veins.

Acute inflammation, excited by blows, gonorrhœa, &c., is relieved by leeching the scrotum, or opening some of the scrotal veins, by purgatives, and the exhibition of tartar emetic internally.

Chronic swellings or enlargements of the testicle arise from different causes. Some of these diseases may be cured by simple treatment, and others require the early removal of the gland.

Of those diseases that can be cured by simple treatment is chronic enlargement of the testicle; this is caused by chronic inflammation following acute, from direct injury, or by the irritation which stricture far back in the urethra produces; and sometimes this enlargement follows a course of mercury given for venereal ulceration. The treatment required in these cases differs according to the causes. The swelling following inflammation may be reduced by leeching, blistering, the application of iodine or mercurial plaster; that caused by stricture at the posterior part of the urethra, decreases with rapidity when the stricture is dilated, and the mercurial or venereal enlargement, or both, is much relieved by sarsaparilla and hydriodate of potass. Many testicles have been removed, the disease having been mistaken for scirrhus, &c., when, by simple attention to the causes and history of the enlargement, a few remedies, properly directed, would have effected a cure, and left the patient the use of the gland.

[Compression may not unfrequently be used with great advantage in the treatment of chronic inflammations and enlargements of the testicle, particularly in those cases attended with but little tenderness upon handling. This remedy, which has within a few years been given forth to the profession as new, was pursued with good results in the practice of the Pennsylvania Hospital, in the beginning of the present century. To make regular compression on the testis, nothing is so convenient as narrow strips of adhesive plaster. In their application, the scrotum being first debarrassed of hair, the gland should be seized by the hand and drawn downwards from the ring. The first strip is then to be applied at the upper part, circularly, around the gland, and followed by others in such a manner as to cover completely all parts of the tumour, as will be understood from the accompanying cut.]



Tubercular matter is occasionally deposited in the glandular structure of the testicle, in the same way that it is in the body of other internal organs; the epididymis is the part usually first attacked; the testicle becomes gradually enlarged; afterwards, when softening takes place, it is adherent to the scrotum, matter points and is discharged, and several fistulous openings may remain, from which there is a constant secretion. These may be injected with advantage with astringent solutions, as of the sulphate of zinc or copper, attention being paid at the same time to the general health. Sarsaparilla, steel, or iodine, may be exhibited internally; occasionally when the matter is discharged, and the testicle no longer supported by the investing integument, a protrusion of part of the substance of the gland in the form of a fungus occurs, and which continues rapidly to increase, until the protruded part is much larger than the opening through which it first sprang. This prevents the skin being brought together over the fungus, and which it is necessary to remove. Some practitioners prefer destroying the protruded portion by escharotics, a slow and painful process; a quicker and more effectual method is to shave it off on a level with the surrounding skin by means of a sharp bistoury: it is astonishing how quickly after this proceeding the skin will heal. A more

formidable deposite occurs in the gland, which gradually and entirely diplaces the original tissue, and forms at first a solid mass, similar in structure to common fibrous tumours in other situations; after a time, small cells appear in the substance of the tumour—hence the name of Cystic Sarcoma. This disease is characterised by its slow growth, its great weight, and firm solid feel. It could only be confounded with scirrhus; and the absence of pain, and freedom of the cord and inguinal gland from the extension of the same deposite, sufficiently distinguish it from the more malignant structure. In its early stage it certainly is not malignant, though it is doubtful whether irritation and interference, as puncturing, &c., will not make it to be of that character. The only treatment that is of any service, is the early removal of the gland.

The testicle is occasionally attacked by most acute nervous pain, and which cannot be traced to any particular cause. This must be combated by attention to the general health; by exhibition of mineral tonics, and by local soothing applications. On no account ought any operation to be thought of in such cases, as possibly the pain might be transferred to another part.

The testis is the subject of two forms of malignant disease—cancer, which is exceedingly rare, and medullary fungus. In the one case, the tunics and gland present a stony hardness, with great irregularity of surface. The skin ultimately becomes involved, discolored, and the patient suffers lancinating pains in the adherent parts; his general health is affected rapidly, and he becomes sallow and emaciated. The cord and lymphatics are soon affected, and thus all chance of a cure are cut off. In the early stages of the disease, castration may be warrantable.

The medullary or spongy testicle soon attains a considerable size, without great uneasiness to the patient. It is smooth and uniform on its surface, and of soft consistence. It is elastic, and yields readily to pressure without pain being caused thereby. It may almost be supposed, by a person not possessing the necessary tact, to fluctuate; and in the hope of finding fluid, incisions and explorating punctures may have been made. In this disease, sooner or later, the inguinal and internal iliac clus-

ter of glands become involved, and the cord is also affected after a time. If the surface becomes broken in any way, a fungus, which grows rapidly, and may furnish blood profusely, is certain to spring up. The only hope of a cure is from the early removal of the disease by castration, as already directed. The disease generally recurs after no long interval: but many patients have remained free from any affection of the same nature for a series of years.

The operation of castration is one not attended with any great danger or difficulty in its performance. The scrotum having been previously shaved, and kept on the stretch by the hand placed behind it, (as represented, in treating of the operation of hydrocele a few pages forward,) is incised from over the external abdominal ring to its bottom; the cord is forthwith exposed and insulated; the assistant passes his fore-finger under it, compressing it gently. It is then divided by placing the bistoury underneath, and cutting outwards. A few touches of the knife will separate the cellular connexions and the gland to its coverings; the vessels are pulled out from the end of the cord and tied, as well as those on the septum of the scrotum, and in the cavity from which the tumour has been taken. On no account ought any skin to be removed unless it is adherent to the gland, or involved in diseased action. The edges of the wound must not be put together for many hours, otherwise a large bloody swelling hæmatocele is certain to form, with perhaps excessive bleeding, This can only be averted by opening up the wound and removing the coagula. A piece of lint should be placed betwixt the edges, and a constant irrigation kept up until all risk of oozing has passed away. Then the parts may be allowed to come together. There is little use in employing means to keep the edges in close apposition, as the wound must heal by the second intention; a single stitch may be put in, perhaps even a second; tepid water is then applied after a time, and support given by a T bandage; of course great care must be taken in forming the diagnosis of these tumours, and, before operating on some of them, an exploratory puncture may, with propriety, be had recourse to.

HÆMATOCELE, HYDROCELE, &c.

In consequence of contusion or compression of the scrotum and its contents, effusion of blood occasionally occurs to a considerable extent. The extravasated fluid generally occupies the cellular tissue, and the interspace of the different layers covering the tunica vaginalis. The tissue is filled; and not unfrequently it is broken down, and large masses of coagulum accumulated. This is attended by great swelling, pain, and discoloration, which to the inexperienced are very alarming symptoms. But the swelling will gradually become less tense, and disappear, if the patient be made to observe the recumbent position, the tumour being properly supported by a small pillow, and judicious antiphlogistic treatment at the same time pursued; all general and local stimulation must be avoided, and active treatment, if need be, superadded—such as general bleeding, purgatives, antimonials, and fomentations. This is the most common form of hæmatocele; but cases occur, though rarely, in which the cavity of the tunica vaginalis is the seat of the bloody collection. This may take place when the parts are previously in a sound state, and then the distension is attended with great suffering; but generally it supervenes upon a serous accumulation, as a consequence of injury; and it may be combined with extravasation into the cellular tissue. The same treatment is applicable in the first instance; at an after period, evacuation by puncture may be resorted to. If an hæmatocele form in the tunica vaginalis after the evacuation of the fluid of hydrocele, and when the blood may have been exposed to the action of the air, it is very liable to become putrid, and the only effectual treatment would be a free and depending opening in the tunica vaginalis.

Hydrocele, or accumulation of serosity in the tunica vaginalis testis, is a very common disease, and often not traceable to any exciting or remote cause. It is attributed sometimes by the patient to powerful exertion of the abdominal muscles, or to external injury; more frequently it depends on thickening of the coats of the testis and about the epidydimis, the result of either acute or chronic disease; not unfrequently it is connected with some affection of the urethra. Effusion into the serous envelope

of the testis makes up part of the swelling, in the greater number of acute inflammatory attacks of the part; this is absorbed as the action abates; but frequently part of the fluid is left, and the balance betwixt the absorbents and exhalants being somewhat destroyed, greater accumulation takes place; or this often occurs without previous pain or tenderness, the patient's attention being first attracted to it by some degree of weight and enlargement of the part. The increase is generally very gradual; after a time it may attain a very great bulk, and contain even many pints of fluid. The different layers covering the tunica vaginalis become thickened, as in large hernia, and the fluid is of various consistence and colour. It is generally straw-coloured, and contains albumen; sometimes it is dark, thick, and glairy. I have occasionally seen it coagulate on cooling, and it sometimes also contains shining flakes of cholesterine. Collections of serum sometimes form in cysts along the cord,—unobliterated parts of the neck of the peritoneal protrusion. These may exist alone, or accompany the collection in the vaginal coat of the testis. They not unfrequently attain a large size, and descend into the scrotum. The testicle, in such cases, is frequently distinguishable at the lower part of the tumour. Whereas, in hydrocele of the tunica vaginalis testis, the gland cannot be readily detected, or its condition ascertained, until the fluid has been evacuated. An adventitious cyst is occasionally developed between the tunica vaginalis and albuginea, which, as it increases in size, projects into the cavity of the tunica vaginalis, being covered externally by that membrane, and is another form of encysted hydrocele. The fluid in this case does not contain albumen.

Tumours of the scrotum, caused by collection of serous fluid in the tunica vaginalis testis, can readily be distinguished from all other swellings of the part—and these are numerous, and of various consistence and composition. Hydrocele is generally smooth, uniform on the surface, and of a pyriform shape; the skin is tense and shining; the tumour is often translucent; fluctuation can be readily detected, and the cord is felt loose and unencumbered when the neck of the swelling is grasped and pulled down. In the history of the enlargement it will be

described as having commenced at the lower part, and gradually ascended towards the ring. The general character of hydrocele, indeed, is tolerably distinct, and can scarcely be mistaken; many of the signs, however, may be wanting. The translucency of the tumour may be obscured by the thickness of the tunics, or by the discoloration and alteration of the contents; and the feeling of fluctuation may be destroyed, in some measure, from the same causes. The freedom of the cord may be lost in consequence of extension of the swelling upwards, or by the formation of another collection in its course, or by descent along it; for hydrocele of the cord and tunica vaginalis testis often coexist; as also do hydrocele of either, with hernia. The swellings, caused by fluid collections on the cord, can be distinguished by fluctuation, which may be communicated or not to the scrotal tumour. In the majority of cases, the exact state of matters may be elucidated by desiring the patient to exert his abdominal muscles, as in coughing, and then ascertaining the extent of the impulse imparted to the tumour; when the patient is placed in the recumbent position, and pressure made upon the swelling, reduction will generally be effected, if it consist of a descent from the abdominal cavity; but such reduction cannot possibly occur if the tumour is encysted. No one sign is to be depended upon in forming a diagnosis; it is only by a review of all the circumstances, and a strict inquiry into the history, that mistakes can be effectually guarded against.

In pure hydrocele, the fluid may be drawn off from the tunica vaginalis, by means of a trocar and canula, so as to remove the swelling entirely. Very frequently, however, thickening and enlargement of the testis and its tunics make up part of the tumour; and this is often ascertained beforehand, by the feeling of hardness at the posterior part. In such cases the fluid may be removed, but little advantage is gained by any such operation. If the enlargement is of a simple nature, suspension of the part and the recumbent position, for a time, may be advisable. The abstraction of blood locally, the application of some discutient plaster,—as that of ammoniacum, with or without the addition of mercury or iodine,—repeated blistering of the part, and the exhibition of deobstruents internally, will be had

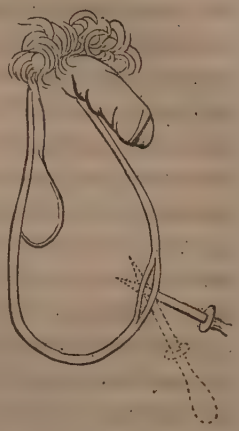
recourse to according to the size, hardness, duration of the part, and obstinacy of the disease. In very many cases, attention to the state of the urethra will be found useful, and, in fact, indispensable to the cure. When the testicle is unaltered, or but slightly changed, it is impossible to feel it, or to ascertain, with any certainty, its real condition, until the tunica vaginalis has been emptied; for the gland occupies the posterior and inferior part of the swelling.

The existence of fluid in considerable quantity, and the propriety of its evacuation, being both very apparent, the palliative cure, by puncture with a small trocar and canula, may be adopted. The coverings are put upon the stretch by grasping the swelling behind with the left hand expanded, whilst the trocar, held in the right, is introduced perpendicularly to the surface, at the most prominent part, and about midway betwixt the neck and lower part of the tumour; this is to be done quickly, but steadily; and the instrument is slid, not plunged, into the swelling. After its point has penetrated so far as to carry the end of the canula fairly within the tunica vaginalis—and this is at once known by the freedom with which it moves, and by the want of resistance—its direction is changed in some measure. At the same time that the instrument is directed upwards, the tube is pushed forwards by the thumb into the cavity; and the stilet is withdrawn within it, as here shown.

A lancet-pointed trocar, with a spring canula—Andre's—may be used for the tapping; but the round one, commonly used for the injection, answers the purpose very well, if in good order and not over large. The canula is withdrawn as soon as the cavity is emptied, the opening is slightly squeezed together, and the part is supported by a bag-truss for a short time. Sometimes the fluid is not reproduced, and the patient, by this simple and very slightly painful proceeding, obtains a radical cure. It happens, occasionally, that the whole of the fluid cannot escape from one opening; there are partitions in the cavity, and this may have either been the case from the first, or may have occurred as a consequence of inflammation; in other words, the cyst may have become multilocular.

Instead of drawing off the fluid and permitting the sac at once to collapse, a different mode of procedure has lately been practised. It consists in making one or more punctures with a largish needle through the coverings, into the vaginal coat, so as to permit merely a drop or two of the serosity to ooze out externally. The internal opening remains pervious for a time, and the contents of the sac are admitted into and diffused freely in the cellular tissue, betwixt the layers; an anasarcous hydrocele is thus substituted for an encysted one, and the fluid that has escaped is removed by absorption. This little operation may be repeated again and again; but of course caution in its performance must increase as the contents of the tunica vaginalis are diminished, and the surfaces come nearly in contact. These methods, however, cannot by any means be depended upon for a permanent cure; the secretion in general re-accumulates, and after a time the tumour again proves annoying from its bulk.

The patient may be satisfied to have the tapping or puncture repeated from time to time, but generally a radical cure is desired. Some very severe and very hazardous operations have been resorted to for this purpose, which the absence of pain and danger from the disease render unjustifiable. It used to be the practice to lay open the tunica vaginalis, with its superimposed tissues, by an incision from one end of the tumour to the other: to fill the cavity with charpie, which was retained



for eight or ten days, until suppuration was fairly established; and then to dress the two surfaces of the serous membrane separately. The cavity was sometimes laid open by caustic potass; or inflammation and discharge were excited in it by the introduction of a seton, the size of which was gradually diminished. Any one of these proceedings was attended with great suffering, and a tedious confinement; and after all, they were not more effectual than the simple method, by injection, now generally practised. The serum is evacuated, as above shown; and especial care must be taken, when injection is contemplated, that not only the point of the canula be perfectly introduced into the cavity, but that the opening near its extremity, which is necessary for its fitting accurately to the stilet, should also be deeply lodged. If this be not attended to, or if, through carelessness, the tube be partially withdrawn before or during the process of injection, the tunica vaginalis may be separated from its investing layers, as shown above; and the cellular tissue, instead of the serous cyst, will become partly filled with irritating fluid. It is a mistake of a very dangerous nature, and one which has sometimes been followed by extensive suppuration and sloughing. Various injections are used; cold water, a solution of the sulphate of zinc, or of other astringent or stimulating salts, wine or spirit. Wine is used either pure or diluted. I have been, from the commencement of my practice, in the habit of using port wine without water, and have very rarely failed in effecting a cure. The strength of wine is very variable, and more dependence, it is said, can be reposed on a solution of some astringent salt in water; accordingly, a drachm of sulphate of zinc to sixteen ounces of water is often used for the purpose; but whatever the injection may be, the effects of it must be looked to, otherwise there is great risk of failure. The strongest bodied and harshest port wine, or even a much stronger solution than that above,

will in some cases produce not the least heat or uneasiness in the part, however long retained. There will follow no excited action, and consequently no cure. In other cases, the injection will sometimes be found unbearable; and if persisted in, a great deal more action than necessary will ensue. Three or four ounces of port wine should be injected by means of a small gum-elastic bottle, with a nozzle and stop-cock fitted to the canula. Some slight warmth and pain are complained of, extending along the course of the cord; and the patient, perhaps, becomes a little faint. After having retained the fluid for a few minutes, it is permitted to escape, and a fresh quantity injected; this gives rise to an increase of the unpleasant feelings. The cavity is then emptied thoroughly, the surfaces rubbed slightly on each other, and the canula withdrawn.

If the patient complain very much of pain, the injection is retained only for a very short period. If, on the contrary, he does not seem to feel even the second quantity, some stronger fluid should be substituted; and I have, again and again, in such cases of unusual insensibility, or when the disease has returned after injection with wine, thrown in a quantity of ardent spirit undiluted, with the best result, using merely the spirits in common use, whiskey or gin. The effect of injection is a certain degree of inflammatory action in the tunica vaginalis, with a rapid swelling from effusion of coloured serum into the cavity, and also of serosity into the cellular tissue connecting the various coverings and integuments; a certain degree of thickening of the tissues adds to the tumour. The inflammation sometimes is so intense as to terminate in deposite of lymph. In general, the painful feelings will soon abate, the products of the excited action are gradually absorbed, and after a short confinement, not entirely to bed, a permanent cure is obtained, very frequently without any agglutination of the surfaces of the tunica vaginalis or obliteration of the internal cavity. Sometimes bands and partitions divide it, and in other cases there is a complete adhesion throughout, between the free and the reflected portions of the serous surface. In many cases, after the injection has been used, and the swelling of the coverings abated, the tumour is found to fluctuate again; and it may be

even observed to be translucent; but, notwithstanding, the fluid gradually disappears, the process of exhalation and absorption keeping pace with each other, and the cure is complete and permanent.

The derangements of the male urinary organs in connexion with those of the functions of the kidneys, are productive perhaps of greater misery, suffering, and danger to man, than those of any other organ or set of organs in the human body. A great many of these maladies are brought on by the carelessness of the individual, and many are entailed upon him by the ignorance and rashness of those who attempt the repair of mischief, probably trifling in the first instance. It cannot be denied, and it is no less deplorable than true, that by far the greater number of grave and serious injuries of the urethra and bladder have been inflicted by pretenders to surgical knowledge, and that a considerable number of their diseases which come under the notice of surgeons, are the product of mismanagement on some previous occasion. We meet with few accidental wounds of the bladder and its connexions, in comparison with those instances in which the patient has perished from the injury, through ill-directed attempts to reach that viscus. The prostate has been thrust from the urethra; the gland has been lacerated, and the bladder detached from the bowel; this latter viscus has been extensively opened; the coats of the bladder have been unnecessarily wounded; they have been seized and dragged down along with stones, and torn by the forceps; the pelvic fascia has been cut open,—than which there can be no more fatal injury; and in innumerable instances, the soft parts filling the outlet of the pelvis have been bruised and lacerated to such a degree, by the introduction of instruments in attempts to remove foreign bodies, that the patient, independently of the exhaustion of his excitability, and the shock of his nervous system, has been irretrievably shut out from all chance of survival. Then let us consider how many patients of late years have lost their lives in consequence of exploration of the bladder, and attempts to seize and break stones therein with the various lithotrites; and how often the apparatus has been broken or bent in the bladder, or been entangled in the passage from it.

Also, it is well ascertained that a great many of the most intractable strictures which are met with, accompanied by disorder and alteration in the structure of the bladder and kidneys, and causing often that most agonising of all human suffering, retention of urine,—have had their origin in high inflammatory excitement of the passage, brought on by the imprudent introduction of instruments during the persistence of gonorrhœal discharge. Many very bad and obstinate strictures are to be traced to laceration of the lining membrane of the urethra, by the ill-directed employment of catheters, in careless and awkward attempts to relieve patients from the pain and danger of retention; and even worse consequences, if possible, follow the unwarrantable thrusting of cutting catheters and caustics into this tender passage.

Great and immediate danger results from injury to the urethra from without. The passage may be divided along with the superimposed parts; or it may be extensively opened, or even torn across, without wound of either the integument or superficial fascia of the perineum. The latter injury is caused by blows with an obtuse body, as by a kick on the part, or by a fall astride a beam, the urethra being thus crushed against the resisting arch of the pubes. Occasionally the case is complicated and aggravated by solution of continuity of the bones, fracture of the rami of the pubes and ischium, or diastasis of the symphysis; the urethra or even the bladder may be wounded by a spicula of bone: the first is a highly dangerous occurrence, the latter an inevitably fatal one. A beautiful specimen of this last injury, obtained from the body of a poor boy who was run over by a loaded wagon, is preserved in my collection. In wounded urethra, the principal danger to be dreaded and guarded against is the infiltration of urine. When there is a free external opening, there need be no apprehension of the consequences; but if it be small and indirect, or if there be reason to suppose that there is a wound internally without an external opening, then the practice must be prompt and decided. There will at first be profuse flow of blood from the penis, and great hæmorrhagic swelling of the perineum, probably accompanied by extravasation and dark swelling of the scrotum,—hæmato-

cele. The patient will find, if he have unfortunately made the attempt, that he cannot pass water; if any have flowed, it will have been in small quantity and bloody, with intense pain and smarting in the perineum. A full-sized catheter must be passed and retained; if difficulty is experienced in effecting this, and if there is reason to suppose that any urine has escaped with the blood into the cellular tissue, then a free and deep incision must be made into the perineum in the mesial line, without hesitation or delay; the catheter can then be passed, if need be, from the fore part of the canal; or if the bladder is not relieved, an instrument with a slight curve may be introduced from the wound. No dissection or separation of parts is necessary; that has been effectually done by the effused blood.

After complete division of the urethra, the anterior part has sometimes been permitted to close, and in consequence, the urine has continued to be discharged entirely through a false passage; this is the result of carelessness and inattention, for which the patient is generally more to blame than the practitioner. I have more than once had occasion to relieve a patient from so inconvenient a state, by cutting down upon the canal in the perineum, and carrying a catheter onwards from the orifice into the bladder. The instrument is passed down to the obstructed part, and an incision is made over its point, directly in the line of the raphe and through the track of the fistula; the urethra is thus opened, and the catheter passed without difficulty. Many of the cases were recent, the injury having been inflicted not many months previously.

Cases.—One patient, in whom the natural course of the urine was thus restored, had most foolishly and unaccountably submitted to the inconvenience for fifteen years. Previously to the injury, he had laboured under some difficulty in making water. He rode to town, and had a caustic bougie thrust into the urethra by a great advocate for that most atrocious practice. His horse stumbled with him on his return homewards, and he felt that his perineum was slightly bruised. As a consequence of the first, and probably the greater injury, and the subsequent accident, inflammatory swelling and sloughing took place. The

perineum was opened late, and the cure, if such it can be called, ended by all the urine passing through fistulous apertures. I was called to him on account of retention. The urine had latterly been passed through the false passages, with difficulty, and after much straining, and it was loaded with quantities of viscid mucus. The perineum was freely incised, so as to reach the posterior part of the canal, where it was dilated; and at the same time the knife was carried forwards to the point of a catheter in the anterior portion. The catheter was retained for a few days; and afterwards, by occasional employment of this instrument, and of metallic bougies, the passage was restored very much to its healthy state; all the fistulous openings healed, and the induration of the perineum disappeared.

This occurred eight or ten years ago. The patient applied for relief not very long since at the North London Hospital. He had permitted the contraction to return to a considerable degree; abscess and sloughing of the cellular tissue and skin of the perineum had followed. The passage was again opened up, with great relief in all respects. The case is reported in the "Lancet," together with another in which the passage had been totally obstructed for twelve years, the result of severe external injury. The obliterated part was opened by the use of a trocar, followed by the catheter. Everything promised well for a time, but the ulcers in the perineum and groin, which had been long open, unexpectedly assumed a decidedly malignant action, and thus all hope of ultimate cure was cut off. While these pages were going through the press, another case presented at the hospital, in which I found it necessary to cut into the perineum, in order to pass a catheter into the bladder. The patient had lost the whole of the penis many years previously, from phagedenic ulceration. As is usually the case when the penis is shortened from any cause, stricture near the orifice took place, and continued some distance down the urethra—the contraction was neglected, and it existed to such a degree, that a catheter could not by any management be placed in the bladder; the whole urinary apparatus was becoming deranged from the stricture. The perineum was freely opened in the mesial line, a

catheter passed into the bladder, and the patient soon left the hospital, passing nearly the whole of his water in a full stream through the urethra—the opening in the perineum had nearly closed.

DISEASED URETHRA.

Stricture of the urethra in the most aggravated form is, without doubt, the result of injury inflicted upon the passage, and occasioning either laceration, or intense inflammatory action. It does arise otherwise, from specific inflammation or gonorrhœa of long standing, probably neglected or ill-treated, and aggravated during the first stage by acrid stimulating injections and free living; or it may be traced to irritation communicated from the neighbourhood, as from repeated attacks of hæmorroids, or stone in the bladder. Acrimony of the urine not unfrequently produces great excitement of the urethra, attended with discharge, and heat in making water, and sometimes even followed by hernia humoralis,—as swelled testicle is absurdly enough termed. In such cases the secretion from the kidneys will be found loaded with acid, or it may contain either amorphous or crystallized sediment. A continuance or frequent recurrencc of such attacks may lay the foundation for disease of the urethra. All affections of the passage, whether recent or of some standing,—gonorrhœa, gleet, stricture,—are aggravated by this state of the urine, and in many cases little else than its correction is required to remove all the symptoms. The introduction of bougies might thus be sometimes avoided; and even when these are absolutely necessary, the passage will be smoothed and the cure expedited by the employment of very simple therapeutic means.

The passage is contracted at various points; most frequently about four inches from the meatus; but sometimes much nearer, and even close to it. It is often enough narrowed as it passes through the deep fascia, betwixt its sinus and the apex of the prostate. The extent and tightness of the stricture will be found to depend very much upon its cause and duration. It consists of a thickening and condensation of the submucous tissue, the result of lymphatic effusion. The lining membrane,

more especially behind the contraction, is somewhat thickened, vascular, and more adherent to the adjacent parts than is natural; anteriorly it is plicated in a longitudinal direction. The canal behind is, moreover, dilated, sometimes to a great extent; anteriorly its calibre is diminished. The bladder is contracted and thickened in all its coats, but more especially in the muscular, as seen in the sketch, p. 471. More remarkable specimens of thickened bladder may be met with, but in this the pathological changes are well seen. In my collection there is a bladder, the muscular coat of which resembles in strength the left side of the heart. The stricture in the membranous portion, the dilatation behind, the state of the canal anterior to the contraction, the congested appearance of the mucous coat of the bladder, its diminished capacity, the enlargement of the muscles of the ureters, and in fact of the whole detrusor urinæ, are all well and clearly exhibited in the sketch referred to. The cause of these changes,—namely, the resistance to be overcome, and the means of effecting this,—stand in need of no explanation; the sketch speaks for itself, saving much trouble, and a great waste of words. Then, in more advanced stages of the disease, it may be expected that, under the constant strain and almost unceasing exertion, some part of the machine must yield. The urethra behind the stricture, it has been already said, becomes dilated, and even more remarkably so than exhibited in the cuts; and this dilated portion furnishes a vitiated secretion, which is troublesome to the patient, and is increased after any debauch. The water lodges here, and runs out incontinently after the patient has felt satisfied that the bladder was tolerably empty, and has disposed everything accordingly. It sometimes becomes the depository of concretions, which may prove troublesome by shutting up, like a pea-valve, the opening anteriorly. Ulceration is apt to take place on the inner surface, from the pressure and irritation; a few drops of urine may ooze into the submucous tissue, through a trifling rent produced during a violent fit of straining, in an attempt to overcome the resistance; or abscess may form in the condensed parts towards the surface, so as to establish a communication with the dilated part of the passage, and ultimately with the exterior. The urine, after

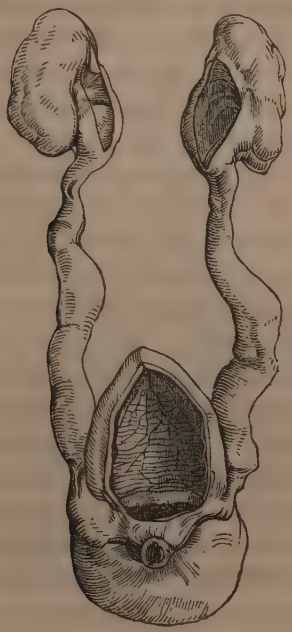
a few days, escapes more readily than heretofore; and though the patient is inconvenienced by the discharge, and by the draining of the water backwards, he is, upon the whole, much relieved; the frequent desire, the forcing and consequent evacuation of the contents of the bowel, and the involuntary dribbling during the night and after making water, all disappear for a time. The new opening then contracts in some degree, the symptoms recur, and fresh abscesses and fistulæ form; or on the other hand, the coats of the bladder yield, the lining membrane becoming protruded betwixt the fibres of the detrusor; and this may occur at one, or at many points, forming, as it were, a series of supplementary bladders of various capacities.

These pouches are found to contain vitiated mucus, in many cases almost puriform, their communication with the general cavity being in a measure closed. In the retention they occasionally yield, and extravasation of urine takes place into the loose tissue around the bladder. The pouches or cysts may also contain urinary concretions entire, or portions of stone, which have either broken spontaneously, or been subjected to the crushing process.

There is in my collection a bladder obtained from a man about eighty; the prostate is much enlarged; there is a large concretion, with a number of broken fragments, contained in the viscus, which is much sacculated; and several of the pouches contain calculi, or fragments of the outer layer of one which had broken down spontaneously. Such preparations are not uncommon. I was so unfortunate, some months ago, as to lose a patient after lithotrity. His urine became suppressed soon after the operation, and this was well accounted for by the disorganized state of the kidneys, of which however, there was no evidence furnished previously. In attempting to pass a catheter, in my absence, the urethra was torn, it would appear; and the patient suffered much from the very protracted trial. A cyst in the posterior fundus of the bladder, with a smooth rounded opening barely capable of admitting the end of a common quill, contained a concretion about the size and shape of a small pea, along with some sand. The cellular tissue around the cyst was softened, partly by putrefaction after death; the peritoneal sur-

face was sound and unbroken at every point. The operation had been performed in public, and the parts were likewise exhibited to the pupils. The case was published in the "*Lancet*," and the omissions in the hospital books were supplied in that work; but, by some strange oversight on the part of the reporter, no notice was taken of the presence of any foreign body in the cyst. It is but fair here to state, that the introduction of an instrument, in this case, may have been attended with peculiar difficulties, in consequence of the addition of bony matter, in great abundance, to the ossa pubis at the symphysis on both aspects; whether the result or not of violent injury at some former period cannot now be ascertained. This condition of parts, though very apparent after maceration, could not have been ascertained during life, owing to the extreme corpulency of the patient.

The ureters become dilated in cases where the difficulty of emptying the bladder is great, and that viscus is diminished in capacity, as when containing a large calculus; the valvular arrangement at their orifice then becomes destroyed, and distension of these tubes, and of the pelves of the kidneys, with diminution of the tubular and secreting apparatus, takes place to an enormous extent, in order to compensate for the contraction of the natural reservoir. These changes are here shown to have formed, in a very remarkable manner, in the organs of a very young subject. The boy, under three years of age, was sent to the Edinburgh Hospital by Dr. Trail of Arbroath, and placed under my care. He was supposed to labour under calculus vesicæ. It had been necessary to draw off the child's water for some time, and a stone was supposed to be detected. It is barely possible that the presence of a foreign body had been the cause of all the sufferings, and of the alterations in the form and structure, which led to the fatal termination. I sounded the patient most carefully and repeatedly, and could detect no foreign body. The calculus may have been small, and may have passed off in the interval betwixt his examination in the country and that in the hospital; though it is doubtful, in the paralyzed state of the bladder, if that could have occurred. The bladder had become greatly distended from some



cause, and must have remained so for many days before assistance was procured. There can be no more complete exemplification of what has been advanced in regard to the yielding of the coats of the bladder and ureters, than the one here given. The opening into a very large pouch is seen in the posterior fundus. A cyst from the side of the bladder, with a rounded and narrow opening, is also seen in the sketch, p. 472. The bladder, in that instance, had regained its natural condition, both as regards the thickness of the coats and its capacity; but such a material alteration as this diverticulum could not be expected to disappear at any time, even after removal of the cause.

The existence of slight stricture may be suspected, when there is liability to discharge of vitiated mucus from the urethra, when the venereal appetite and power are diminished, when chronic swelling of the testes occurs, or frequency in making water with scattering of the stream. The more confirmed and tight contractions give rise to difficult micturition, increased by

any excitement of the system or derangement of the digestive organs. The state of the urinary secretion, as already noticed, influences the symptoms very materially; the lining membrane is irritated and congested, and the muscles surrounding the bulb and the membranous portion of the canal are often spasmodically affected by the passing of acrimonious fluid. Complete retention is thus often brought on. The resistance offered by the stricture is overcome, to a certain extent, by the unnaturally developed detrusor; but, in addition to that, the assistance of the levator ani, together with that of the abdominal muscles, is constantly required. Great pressure and straining are demanded, and the contents of the intestinal canal are often evacuated at the same time, to the great inconvenience of the patient. The water flows in a very small and scattered stream, and occasionally is at first voided only by drops. The mucous surface of the whole of the passages,—ureters, bladder, and posterior part of the urethra,—furnishes a great quantity of vitiated discharge, which subsides from the urine in cooling, and often composes half of what is evacuated. It is tenacious, and often exhales an offensive and peculiar odour. This secretion is constantly observed more or less in the various diseases of the urinary organs,—stricture, stone, and enlarged prostate,—especially when any fresh impulse is given them; as when a change in the nature of the urine is caused by irregular living, when a fit of stone is in any way induced, or when, from neglect, accumulation in the bladder is allowed to take place to a considerable extent. The secretion is poured out as in other situations, to sheathe and protect the surface; and it is not, unless under certain circumstances, a source of irritation.

The sympathies and functions of the parts are completely subverted by stricture. Sometimes the urine is voided with difficulty and after great exertion; at other times, as during the night, it passes off involuntarily. The neck of the bladder in its normal condition is closed by circular fibres of elastic tissue, and also by the collapse of the sides of the prostate. On the other hand, the passage is opened by the action of the fibres of the levator ani inserted into the gland,—the compressor prostatæ, as it has been named,—and by the pressure from behind.

In stricture, the true neck of the bladder, and the passage behind the obstacle, are much widened, and the contractility or elasticity of the viscus, and of the circular fibres at its neck, is destroyed. The cavity is partly emptied, during waking hours, by straining and violent action of the abdominal muscles, so that then the individual is comparatively in a comfortable condition. But during the unconsciousness of sleep the urine runs over, and this incontinence causes much annoyance and discomfort. This was well exemplified in a case which occurred in the North London Hospital, Jan. 1838. A young man had, some years previously, lost almost the whole of his penis from mismanaged phagedenic sore; it was on a level with the abdominal parietes; and the orifice of the urethra, as in all such cases, was much contracted. The patient had been distressed by incontinence of urine during the night, for more than twelve months, and had thereby been thrown out of employment; the opening was exceedingly tight, so much so indeed as to admit a dressing probe with difficulty. A very small catheter, No. 1, was passed with some trouble, and retained for forty-eight hours. The orifice was then dilated, and a most rapid and perfect cure followed; so that within a few weeks he was able to earn his livelihood again.

The health of a patient labouring under stricture, suffers materially from pain, want of rest, and wasting catarrhal discharge; his countenance becomes sallow and anxious, his nervous system is excited, he is irritable and peevish, and often is distressed by weakness of his loins and lower limbs; pain and gouty swellings of the feet, ankles, and knees, add to his sufferings. The bladder, in stricture, is incapable of containing any great quantity of fluid; and if by any chance its escape is completely arrested, the most intense and lively suffering is immediately occasioned, the patient becomes alarmed and anxious, and his efforts to procure an evacuation are incessant. Violent pain is felt in the hypogastrium, aggravated by pressure; his pulse is accelerated, copious perspiration breaks out, he becomes delirious, and in the end comatose. During the violent efforts sudden relief is perhaps felt; still, however, the urine does not pass. Pain and smarting, attended by swelling, are felt near the anus,

and are speedily followed by enlargement of the penis and scrotum; the dilated part behind the stricture has yielded, and the urine has escaped into the cellular tissue. This state of parts will be followed by rapid sloughing, not only of the deeper parts, but also of the external coverings, if instant relief be not afforded; and the patient will be fortunate, if his constitution bear up under the local irritation and wasting discharge which must be induced. Wonderful recoveries, however, are occasionally made even after careless management in the first instance, and the successful efforts of nature in affording a new covering to the exposed testes cannot be sufficiently admired. The cicatrization is often slow for some time; but after it has reached a certain distance it is remarkable how rapidly the parts are drawn within the integument, which is borrowed from the perineum and surrounding parts.

The patient will generally be relieved of the uneasy symptoms caused by ordinary strictures, by attending to the digestive organs, correcting the secretion of urine if necessary, and diminishing still further the irritability of the canal, for which last indication a few gentle introductions of a bougie at considerable intervals are found to suffice. A painful burning sensation is experienced, in passing the bougie through the naturally narrow points of the urethra for the first few times, and some drops of blood may perhaps follow the first operation; but by allowing time to elapse between the introductions, all uneasy feelings will disappear; the patient will no longer suffer uneasiness, nor feel faint and sick whilst under the surgeon's hands; and so soon as the tenderness and slight swelling, which follow the introduction, have ceased, the discharge of urine will be found very much improved. The irritability and increased vascularity of the lining membrane will abate, as is seen in other membranes of similar nature: as, for instance, when the lining of the prepuce and glans are exposed only from time to time, at first the slightest touch gives rise to strong sensation, but this extreme susceptibility soon diminishes by frequent exposure and contact. The introduction of a bougie must always be performed with the greatest care and gentleness; the patient may be placed either erect or recumbent; if alarmed or disposed to

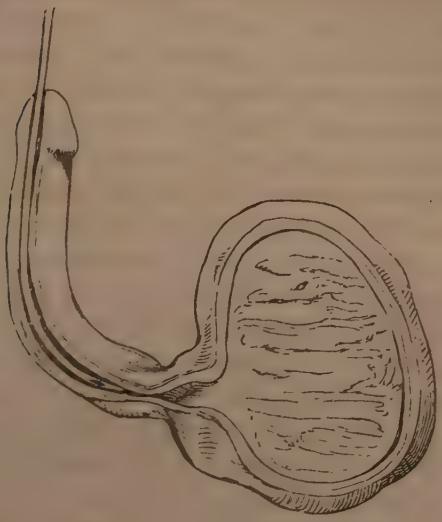
become at all faint—and with some, this peculiarity of sensation is continued in defiance of frequent practice,—the latter position is of course adopted. A small silver catheter with large rings is the preferable instrument, if there is reason to suppose that the contraction is considerable; if not, a plated metal bougie of moderate size, slightly curved throughout, and smeared with some bland liniment, may be used. These are much superior in all respects to the plaster, gum, or other soft and pliable bougies; there is no possibility of guiding the points of these, or of ascertaining what direction they take.

The point of the instrument is entered into the meatus, and gradually insinuated along the spongy part of the passage. The canal is not stretched; in fact, the organ should not even be touched or interfered with at all, and, in the majority of cases, by the left hand, during any part of the operation. The passage is thus left more free, the muscles surrounding it are off their guard, and the natural obstacles are much more readily evaded. The point of the instrument is slid without the slightest force, and with scarcely appreciable uneasiness, along the upper surface of the canal, to that part of it embraced by the layers of the deep fascia and some interposed muscular fibres; the handle is then depressed gently, and the point, still kept in contact with the upper or anterior surface, is slipped into the bladder. This operation may be repeated at an interval of four or five days, when the smarting has ceased and the stream of urine begun to improve. Then, after the original bougie has been introduced and withdrawn, a second, perhaps a size or two larger, will be found to pass even more readily than the first, with less pain and less consequent resistance from the muscles surrounding the passage. It is from the action of these, that the natural obstacles probably are occasioned; they are also the cause of the greater narrowness of the healthy canal, at the point already mentioned. This plan is persevered in until an instrument which fills the entrance, naturally the tightest part of the whole canal, passes along without obstruction. The orifice of the urethra is the best measure of a full-sized bougie for each individual. If these rules be attended to, there will be

but slight risk of a return of the symptoms, unless fresh causes be applied.

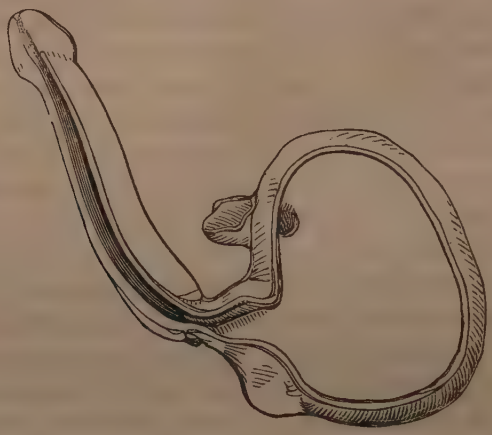
In the management of very badly strictured urethra, when small instruments must of necessity be used, the utmost caution, patience, and perseverence, are demanded from the surgeon, together with a full and lively recollection of the anatomical relations of the parts, and their pathological condition. Lightness of hand, and gentleness of manipulation, will often enable him to overcome difficulties which to others may have proved insuperable. The operation of introducing a catheter, through what has been called an impermeable stricture, is without doubt the most difficult in the whole range of surgical operations, and demands all the prudence, science, and skill of a master. The art can only be acquired, and that gradually, by frequent practice. When the contraction is placed before the scrotum, and when it is very gristly, tight, and unyielding, it may be necessary to lay hold of the hard part betwixt the finger and thumb of the left hand, whilst the point of the instrument is gently insinuated through it; then it is shaken along, as it were, in the dilated passage beyond. A second obstacle, however, will probably present, and this is to be encountered and surmounted methodically and without hurry.

On the succeeding page, the catheter is represented as passed to the stricture, and its point insinuated so far within it. This fact can be ascertained by gently attempting to withdraw the instrument, when it will be found grasped and held firmly. By gentle and persevering pressure, the contraction of the fibres surrounding the part yields; the instrument then slips on into the dilated part behind, and can from thence be passed on to the bladder. The fore-finger in the bowel may serve as a guide, but this is not often required; gradual and steady persistence, without force, will generally enable the surgeon to overcome all difficulties, and to lodge the instrument in the bladder, through the natural passage, without the slightest laceration even of the lining membrane. If the operation has been performed on account of retention, or if that has been threatened,—and it is very apt to follow the swelling which always supervenes more



or less upon the use of an instrument in very bad stricture—it may be prudent to retain the catheter. This is a very efficient, safe, and quick method of freeing the patient from bad stricture. It matters not how small the foreign body may be, nature soon sets about a process to free herself from it; the passage is widened remarkably, and a most profuse discharge established, so that within forty-eight hours the instrument which had been grasped most tightly, lies now quite loose, and the urine flows along it: it may then be withdrawn, and a large-sized catheter or bougie immediately substituted without difficulty. This is the only safe way of taking advantage of what has been called vital dilatation of the passage. The securing of a bougie in the urethra, merely in contact with the stricture, for days and weeks, must appear, to any one of common sense or judgment, a very futile and unsurgical proceeding—a plan certainly not likely to be often called for, in the practice of a man with hands to act and a head to guide them. The catheter well made, properly tempered, and of silver, is alone applicable, in cases of stricture really requiring its being retained in the bladder. Means must be taken to preserve its position; the simplest and best apparatus consists of a band round the waist, and a couple

of strips of oiled silk. These are carried from the rings of the catheter, passed behind the thighs, and both secured to the circular band on the lateral aspects. The instrument should not be retained more than two days, otherwise the openings will be closed by calculous deposite. Within three days after its withdrawal, the state of the canal should be ascertained, and a catheter of moderate size carried on to the bladder; after that, longer intervals may be observed, and the size gradually in-



creased. Thus the worst possible stricture may be conquered, and the patient completely restored to health, if indeed the kidneys have not suffered materially. The urethra assumes again its normal dimensions, and all the dilatations disappear in a great measure. The necessity for powerful action no longer existing, the bladder becomes thinned in its coats, and it is also increased in capacity; all this is delineated in the preceding cut.

The patient from whom it was obtained had, for twenty years or more, laboured under very bad stricture of the urethra, with prolapsus recti dependent thereon; he passed his water almost every hour with great straining, and at night it dribbled away involuntarily. The strictures, one opposite the accelerator, and the other behind the sinus, were exceedingly tight; they were gradually dilated and in a great degree removed, but

the patient had an objection to any very large instruments being introduced. Nos. 7 and 9 were got to pass easily; he was completely relieved of all his uneasiness, could hold his water nearly all night, and recovered the other functions of the parts very perfectly. He was carried off by internal disease unconnected with the urinary organs. The bladder, which must have been at one period much contracted and thickened, is seen to be now capacious, with its coats of healthy appearance, excepting the protrusion of the lining membrane at one point, forming a very pretty cyst, which had probably existed for a great many years. The dilatations of the urethra behind the strictured parts, not altogether reduced to the calibre of the rest of the canal, are also still remarkable. The organs were upon the whole comparatively healthy, and might have continued serviceable for many years without further surgical interference.

TREATMENT OF DISTENDED BLADDER.

Retention of urine must be treated with reference to the cause which has produced it, the nature and situation of the obstacle, and the state of the bladder. The circumstances following upon injuries of the perineum, the nature of stricture, the contracted condition and great strength of the bladder in such cases, together with the symptoms attendant upon accumulation in it, have already been shortly described. The peculiarities of retention, arising from the loss of tone in the organ, or from paralysis of the detrusor consequent upon over distension, and occurring, as it generally does, in connexion with hypertrophy of the prostate gland, require some notice. Inflammation and abscess of this gland, and malignant degeneration of its structure, diseases most fortunately of rare occurrence, give rise to great disturbance in the functions of the bladder. The simple enlargement of the gland often attains considerable volume, without causing any great annoyance. It is at an advanced period of life that this affection is met with, but it is by no means an invariable attendant on old age. In many old men the gland preserves its normal form, and presents no greater bulk than at puberty. The swelling of the prostate in

some instances gives rise to a feeling of weight in the perineum, with uneasiness on going to stool, and slightly painful sensations at the point of the penis after micturition; this latter function is perhaps more frequently performed than before the enlargement. If a patient so affected be careless about emptying his bladder, accumulation gradually takes place; a certain quantity of water, much more than natural, always remains behind, perhaps amounting at length to a pint or more—although some is always evacuated, on the call being made, by voluntary efforts; the urine is mixed with secretions from the coats of the bladder, and these become more and more vitiated; and the bladder comes at last, as is well observed by Sir B. Brodie in his excellent work, to resemble a badly-washed chamber utensil. After some slight debauch, neglect of the first impulse to make water, or exposure to cold, a complete stoppage takes place; but the symptoms are by far less urgent than those already described as accompanying stricture. The coats of the bladder bear distension to a great extent; many hours, and even some days, may have been allowed to pass over before assistance is requested. The water has perhaps begun to dribble off involuntarily, or is passed in small quantity by the efforts of the patient, assisted by pressure on the hypogastrium. In these cases the bladder will be felt distinctly as a large ovoid tumour, rising towards the umbilicus; and fluctuation may even be perceived when the abdominal parietes are not much loaded with fat. At first the dilatation of the posterior fundus takes place towards the hollow of the sacrum, as in the healthy state; then the upper fundus is expanded, and the whole viscus, after a certain degree of distension, rises *en masse*, like the gravid uterus, into the abdominal cavity. The length of the urethra is much increased by elongation of the prostatic portion; but by this displacement, the distance from the arch of the pubes and the passage of the canal through the deep fascia, to the cavity of the bladder, is still further increased. At first the retention is very complete, the posterior part of the gland, which is enlarged and prominent, being forced downwards by the pressure of the fluid, so as to adapt itself like a valve to the commencement of the urethra; but, as already remarked, this obstacle

becomes so far removed, that after a few days the urine dribbles off involuntarily—the bladder running over as it were. But there is always a risk of the coats giving way by sloughing; or urine may be extravasated in consequence of the lining membrane of one of the cysts—which have no muscular coat—yielding, perhaps only in a slight degree. The extravasation within the pelvic fascia, an inevitably fatal accident, is, however, of comparatively rare occurrence.

The management of lacerated urethra has been noticed; should the opportunity of passing a catheter, before the patient has attempted to evacuate his bladder, have been neglected, and swelling from infiltration and inflammatory action have supervened; should the bladder be much distended, and relief not follow free incision of the perineum; or should it be found impossible to reach the bladder by the natural passage, through that part of the urethra behind the solution of continuity,—then the only course that can be pursued is to puncture that viscus. If circumstances do not contra-indicate it, the opening should be made through the rectum in the *trigone*.

Retention of urine, arising from inflammation of the urethra, aggravated perhaps by hard living or other imprudent conduct, may often be relieved by antiphlogistic means, when the parts have been previously in a healthy and undisturbed state, and when the patient is seen before the distension has become very great; blood is taken from the arm, the perineum is freely leeched or cupped, warm baths and enemata are resorted to, and opium is exhibited by the mouth and anus; but the urgency and duration of the symptoms may forbid long perseverance in these means if ineffectual; delay is always dangerous, and although the patient may suffer considerably from the operation, recourse must often be had to the catheter in such cases.

The mode of using the instrument in strictured urethra has already been described; in cases of retention from this cause, the difficulty is often considerably less than when the operation is performed with the view of removing the contraction, the bladder and posterior part of the canal being usually at that time undistended. The delay of a few hours after the accession of the symptoms is here generally inadmissible. The state of

the parts must be adverted to; particularly the tremendous power of the bladder, and the altered and unsound state of the canal behind the stricture. There is no possibility of reckoning how long the latter part will resist the constant impulse upon it; and let it be recollected that the urine may escape into the perineum either by a gradual process, or by the formation of abscess, or by the sudden giving way of the lining membrane of the dilated part. In the former case the cellular tissue is condensed, and the discharge of urine often does not take place for some days after the abscess has been emptied naturally or artificially. In the latter case the cellular tissue is comparatively unaffected; it is pervious in all directions, and the fluid, dark in colour, containing a great quantity of saline matter, and much more acrid by its retention, is immediately extravasated all around, even into the groins and lower part of the abdominal parietes under the superficial abdominal fascia. Occasionally the case is somewhat complicated; perineal abscess has been in progress, and has in some measure been the cause of the retention, perhaps by its pressure; the urine escapes in quantity into the cyst of the abscess, which it distends suddenly and enormously; and then the parietes of this may, in their turn, give way, so occasioning urinary infiltration, in addition to the previously existing malady. The local effects of infiltration have been formerly noticed; the constitutional disturbance is always alarming; the patient is often prostrated at once, and perishes in a very short time, as if poisoned by the absorption of the putrid and irritating fluid; others, again, struggle on, labouring under great depression of the powers of life, with cold extremities, hiccough, disturbed stomach and bowels, confusion of intellect, and drowsiness. They may thus perish after a time, great part of the cellular tissue and skin having sloughed; but, by energetic local and general means, many may be saved from destruction, even in very desperate circumstances. In all cases of retention, when there is reason to suppose that the urethra has been previously diseased, the state of the perineum must be carefully ascertained; this is the first step to be taken. The presence of matter is here indicated by hard, deep-seated, painful swellings; and even when a great quantity of putrid pus and

urine is confined, there is often but little bulging out externally. In cases of neglected and chronic abscess in this situation, the skin is sometimes found discoloured; the tumour is apparent, and fluctuation may even be felt; but if the abscess is acute, the patient must have been sadly neglected, and the treatment conducted in a disgraceful way, when such a state of matters is allowed to occur under the eyes of a practitioner. The arrangement of the superficial fascia, which long resists the progress of fluid to the surface, must be kept in view; and the presence of deep, hard, and painful swelling, coupled with the previous history of the case, and derangement in the functions of the urinary organs, is to be looked upon as a sufficient warrant for making a free incision: very often nothing more will be required in order to afford relief from all the urgent and alarming symptoms. In cases of extravasation of urine, with or without a deposite of putrid matter under the perineal fascia, very free incision must be instantly resorted to; it will not be sufficient to make some trifling punctures here and there in the skin of the penis or scrotum; the perineum must be exposed fully by separating the thighs, and an incision made in the mesial line, two inches long at least, and of considerable depth. If the cellular tissue is much loaded, the bistoury must sometimes be made to penetrate an inch and a half or more, in depth, before relief is afforded. The bladder will thus also be relieved at once, and there will be no occasion in general to introduce a catheter, either along the canal or through the perineal opening. At an after period of the case, means will be taken, as a matter of course, to clear the urethra and favour the healing of the false passages, so as to restore the whole genito-urinary system, as much as possible, to its healthy state.

Should a case of retention present, in which it is found impossible to penetrate the strictured part of the urethra with the catheter, and no abscess has formed, the proper practice is to make a free opening in the perineum, directly upon the obstructed part; to cut upon the end of the catheter, to carry the knife forwards, and having opened the dilated part, then to pass the tube on to the bladder. Or better, the fore-finger of the left hand is introduced into the rectum; a straight bistoury having

been pushed into the mesial line, with its back towards the bowel, is carried onwards to the apex of the prostate, and withdrawing the instrument the dilated passage is opened to the point of a catheter passed down to the obstructed point. This is preferable to puncture of the parietes of the bladder in any situation; but the cases requiring either proceeding will be rare indeed, if the mode of using a catheter be properly understood.

Retention, when the prostate is enlarged, can in general be readily relieved, if a proper instrument be used; in many such cases, the bladder cannot possibly be reached with those of ordinary length. The best prostate-catheter is that made of silver, and it should be at least an inch and a half longer than those employed for other purposes; the beak should also be long, and the curve considerably greater. The careful employment of such an instrument will generally be followed by a successful result, whereas attempts with short catheters, and those of

elastic gum, must almost certainly end in disappointment to the practitioner and injury to the patient. Innumerable cases have been presented to me, in which, for days, persevering attempts have been made to relieve an over-distended bladder; yet nothing flowed but blood, and that in abundance. It then was imagined that the bladder was full of blood, and means were employed, by exhausting syringes and injections of warm water, to break down and extract the coagula supposed to exist. A long catheter was at last used, with the effect of freeing the

bladder of many pounds of high-coloured urine, but of nothing else. Accumulations of blood in the bladder, from fungous growth or other cause, are fortunately not of common occurrence. The instrument must of course in many cases be introduced at intervals of twelve or eight hours, or oftener, according to the quantity of urine secreted, the condition of the bladder, and the feelings of the patient. This practice must be continued, and the bladder thus prevented from getting at all over-distended, until the viscus recovers its tone, and the urine is evacuated naturally in a full and free stream. Under some circumstances also, gum elastic catheters may be introduced and retained for a certain time.

Should it so happen that great opposition is offered to the introduction of the catheter through the gland—and it is generally the posterior and prominent part that comes in the way—it remains for the surgeon to determine whether he will attempt to reach the cavity by puncture through the natural passage, or by tapping above the pubes. Puncture by the rectum is here rendered inadmissible by the anatomical relations of the parts in their altered state. It cannot be effected without either penetrating the gland with the risk of not reaching the cavity, as has happened more than once within my knowledge, or running the risk of wounding the duplicature of the peritoneum, which lies in close contact with its posterior border when in a state of hypertrophy. Puncture above the pubes is always attended with great danger from infiltration,—which it is difficult to guard against—or from peritoneal inflammation, to which the parts in this state of matters are liable. The projecting part of the gland can be perforated easily, and without hazard. Instead of using the catheter for this purpose, it is better to employ a stilette, carried through a slightly-curved and long canula, the point of which, by examination through the rectum, is ascertained to be fairly and deeply lodged in the prostatic portion of the urethra. The point of the canula will of course be filled up by a rounded point during its introduction; this is then withdrawn, and the stilette substituted. I have practised this operation a few times successfully, but a dexterous use of the catheter will render recourse to such a

proceeding seldom necessary. But when the patient cannot be relieved by the gentle and well directed use of the catheter, he must not be left to his fate, and the mode here indicated is the safest that can be pursued.

The punctures of the bladder are operations unattended with difficulty, though fraught with danger; many are the victims that have been bungled out of their lives by the injudicious and awkward use of catheters, and by the ill-timed and imprudent recourse to perforation of the bladder. Cases have come within my observation in which the bladder has been thrust for again and again from above the pubes, after the viscus, previously of small capacity, had emptied itself into the cellular tissue, and become thoroughly collapsed. Some of the errors which had been committed in attempts to reach the bladder from the rectum, in unsuitable cases, have been already alluded to. These operations have been, and are still, much more frequently performed than there is any occasion for. I have, as yet, met with but one case, and that a very peculiar one, in which the opening of the viscus seemed indispensable. Here, however, there was no difficulty in introducing a full-sized catheter; in fact, for some weeks the urine had been drawn off regularly twice or three times a day by one of my private pupils. A slow inflammation of the bladder, however, had supervened, as is often the case, in consequence of injury of the spine. The cavity became much distended with muco-purulent fluid, which could not be drawn off through the urethra; an opening was made above the pubes of sufficient size to admit the finger; it being supposed that the ordinary puncture, with a trocar and canula, would have answered no better purpose than the introduction of a large catheter with full-sized eyes. A quantity of thick matter was evacuated, through the wound, together with a membrane,—whether the mucous lining detached, or an adventitious formation, appears doubtful. The membrane and bladder, obtained some months afterwards, are preserved in my collection.

The puncture from the rectum can be performed without injuring important parts, when the prostate is of its normal dimensions. The canula of a curved trocar is guided by the

finger to the triangular space, bounded by the vesiculæ and peritoneum, the stilette is then protruded, and the whole instrument pushed forwards into the posterior fundus of the organ. The canula is retained for a certain time, until the cause for the proceeding is removed; or the operation may be repeated as occasion demands.

When the bladder has risen high into the abdomen, together with its peritoneal covering, the puncture above the pubes is effected by simple division of the skin and separation of the recti and pyramidales; and a straight long trocar is used for the purpose of perforating the bladder. Care must be taken to retain the canula; and, by position of the patient, infiltration may be guarded against. Patients have occasionally lived after these operations; but the chances in their favour are few, compared to those afforded by withdrawal of the fluid, properly and without lesion, through the natural passages. The operation of puncturing the bladder in any way was not once performed, in a series of years during which I filled the offices of assistant-surgeon and surgeon to the Royal Infirmary of Edinburgh: and it has been performed but once—and that before I joined it—at the North London, (now also named University College Hospital,) since it was opened for the reception of patients. And the cases of bad urinary disease at those institutions during these periods have not been few.

Fistulous openings communicating with the urinary passage almost uniformly close after the removal of their cause, and restoration of the canal to its natural calibre throughout. Frequent introduction of instruments, or long retention of them, will rather tend to aggravate the disease than otherwise. The retention of a catheter for many days or weeks is scarcely advisable under any circumstances; abscess is apt to form in the course of the canal, portions of it are destroyed by ulceration, and I have known some most untractable openings, anterior to the scrotum, thus produced. The occasional use of the bougie, with gradual expansion of the urethra to its proper size, is the first step to be adopted, with the view of ridding the patient of the inconvenience attendant upon the discharge of the urine through the scrotum, perineum, or rectum. Should the track

still remain pervious, after discontinuance of the bougies, the urethra being clear, and the patient's health, besides, perfectly good, some means must be adopted to cause contraction. If there have been little or no loss of substance, the application of a heated wire will be found the most simple and manageable plan. A speculum, of course, should be used, to bring the aperture of the fistula into view when it is situated within the sphincter of the anus. The application is made, if possible, through the whole track, and effectually, so as to cause a thin slough; great destruction of tissue is not desirable. The good effects will not be felt, probably, for a great many weeks; in the first instance, in fact, after separation of the slough, the passage is widened, and the flow of urine becomes even more profuse than before. The amendment is gradual, as the contraction and cicatrization proceed. A second application of a smaller wire may be required, if, after a certain period, the dribbling have not ceased entirely. Great difficulty will be experienced in procuring union, in attempts to cover these openings by paring of their edges, or by the adaptation of flaps. It is next to an impossibility to prevent the oozing of a little urine, and it is as difficult to prevent the escape of discharge from the lining membrane of the passage; besides, a flap, of integument only, is rather apt to lose its vitality, however carefully made, and however broad its attachment. In some extreme cases, an attempt may be made to repair the loss of substance in one part, by borrowing from another; but the surgeon and patient must not be over-sanguine as to the result, and must be prepared to meet with disappointment.

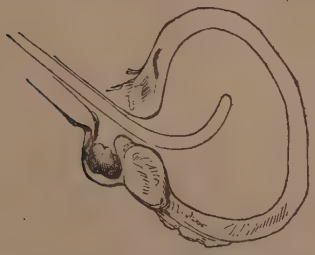
INJURIES OF, AND FOREIGN BODIES IN, THE BLADDER.

Wounds of the bladder within the peritoneal sac, or even behind the reflection of the pelvic fascia, are almost inevitably mortal; they may be inflicted from without by pointed weapons; from without or within, in rash and ill-conducted operations for stone; or they may be the result of violent injury, with solution of continuity, in the bones of the pelvis. I have seen some accidental wounds of the viscus, however, from which patients have recovered very favorably. Wound of the poste-

terior fundus, through the rectum, if it does not pass beyond the bladder, is not necessarily attended with great risk. Foreign bodies, as bullets, have entered the viscus at various parts; the immediate effects have been recovered from, and their removal, after a time, has been accomplished by incision of the perineum and prostate. Foreign bodies have also occasionally been introduced through the urethra, and retained in the cavity of the bladder. Bougies have slipped in; and portions of these or of catheters have broken off in the cavity or canal, and from thence have been carried back by an inverted action of the passage, similar to the antiperistaltic motion of the intestinal tube. Various cases are recorded, in which foreign bodies of various kinds have been introduced into the bladder, heedlessly, or through some morbid feeling of the patient, more especially in females. The instances are rare in the male, in consequence of the length and sensibility of the canal, and the difficulty in effecting the object; yet, occasionally, foreign bodies are found, as the nuclei of urinary concretions in the male.

A case is related in the "Edinburgh Medical and Surgical Journal," vol. xxxi. p. 229, of an old man, who was treated by me, in the Royal Infirmary, for stone, which had been ascertained, by sounding, to be small and soft. The operation of lithotrity was performed, and this, then (1828) by no means very perfect or safe, proved quite successful. In fact, it is the first case in which lithotrity succeeded in this country, and occurred long before the invasion of the professed stone-grinders. The stone had, as a nucleus, a number of seeds of barley, with part of their beards. Some thirteen or fourteen were extracted entire, together with the detritus of the calculus which had surrounded and bound them together. The patient, an old man above seventy, confessed that, whilst employed in assisting the reapers during harvest, he had thoughtlessly passed the barley corns into the urethra, one after another, holding them by their beards; until the symptoms became troublesome, he had forgotten the circumstance, thinking that they might have passed off with the urine, and, strange to say, he did not apply until months after the occurrence, when the crystallized deposite had become abundant, so as to cover the foreign matter completely.

In the most healthy individual, the presence of any foreign body will give rise to the deposite of calculous matter. In some, it takes place, as is well known more readily than in others, and more quickly at some periods in the same individual. Much depends upon the state of the digestive organs, and the consequent quality of the secretion from the kidneys. Deposites of various kinds take place from the urine, and, if abundant and crystallized, portions may be retained in the kidneys and bladder. In this latter situation, their existence may be ascertained by sensible signs. The symptoms and external signs which induce and warrant an examination through the urethra, are pain at the point of the penis, after micturition, and sudden stoppage of the stream during it; in addition, the urine will probably be passed more frequently than it used to be before the accession of pain; and the desire to do so will be more sudden and urgent. Some cloudiness will often be observed in the urine, and a thick white deposite forms in the bottom of the vessel when the fluid cools. The symptoms are generally found to be aggravated by motion in a carriage, or on horseback, and some blood will then probably appear mixed with the urine. As the stone attains volume, other uneasy feelings are complained of, as weight in the perineum, and pain in the sole of the foot. The history of the case should be inquired into, as regards the feelings, about the region of the kidneys, which preceded the disturbance in the functions of the bladder; the period and mode of their accession should also be distinctly made out; it is also highly necessary to ascertain the existing state of the secretion, so that, as far as possible, an opinion may be formed of the condition of the secreting organs. The specific gravity of the urine, and the existence or not of albumen, must be attended to. The concretion is sometimes, though rarely, fixed in the extremity of the ureter, in a cyst of the lining membrane, or in a cavity of an enlarged prostatic duct at the neck of the bladder. A calculus, here represented, is lodged in a cyst, close to the apex of the prostate: in some circumstances this might be touched with an instrument, instead of being passed over as shown in the sketch. The presence of a stone here may co-exist with one or more in the bladder; it has



happened, again and again, that the latter have been overlooked; and a second operation has thus been required for the patient's relief. But generally the stone is loose, and, when the patient is recumbent, lies in the posterior fundus of the bladder. It falls upon the anterior surface when the patient stoops forward, as in making water, and then frequently acts as a valve upon the outlet. The severity of the symptoms will depend much upon the size, form, surface, and number (for there is no limit in this respect) of the foreign bodies. The suffering may have been for a time almost unbearable, and then ceases in a great measure; or, the concretion, which had been smoothly polished on its surface and water-worn, is increased rapidly, in consequence probably of change in the mode of life, and disordered digestion; the new deposite consists of sharp and angular crystals, and thereby all the uneasy feelings are renewed with redoubled violence.

SEARCHING OR SOUNDING FOR STONE.

The operation of sounding must be conducted with very great care and deliberation. It ought to be done at once effectually, but at the same time with extreme gentleness, so as to ascertain with certainty the existence or not of stone, and all the circumstances connected with it; whether or not it is single, with its size, and whether rough or smooth on the surface. The consistence may even be guessed at from the sound emitted when it is struck smartly. The surgeon must first of all be perfectly satisfied that there is really a stone in the bladder; for many mistakes have been committed in this respect, and even by those who have been long engaged in practice. The symptoms of

stone in the bladder, it is well known, may all be simulated in cases of diseased kidney, or from gastric irritation in children, connected or not with teething. In young subjects, the presence of sordes or of worms in the intestinal canal frequently gives rise to almost every symptom of stone in the bladder. A careless mode of sounding, and inattentive observance of the signs so obtained, have too often led to error in diagnosis, and the performance of unnecessary operations. In the first place, such patients should not be sounded at all. If there is any suspicion of diseased kidney, or of derangement of the digestive organs, existing to a considerable extent, these should be attended to in the first place; and if the symptoms do not yield, and gradually disappear, then further inquiry and examination should be made. The rubbing of the point of the sound over the fasciculi of the bladder, or its grating on sand entangled in mucosity, must, in some of these cases, have been mistaken for the sensation communicated by a calculus; in other instances it is reasonable to suppose that a small calculus has actually existed in the bladder, has been struck by the sound, and has afterwards become encysted; or that it has escaped along with the urine, either in the interval between the sounding and the incisions, or after the latter have been made. The surgeon must not be satisfied with a mere rub on something hard; if duly impressed with the necessity for caution and accuracy in this proceeding, he will satisfy himself that he can pass his instrument on all sides of the calculus, and not only feel distinctly that the instrument is in contact with a foreign body, but make himself perfectly certain besides that he hears the stroke of the sound upon it.

[In order to impress upon the student the excellent advice here given in regard to sounding, and to show how much caution is often necessary in coming to an opinion as to the existence of stone, particularly in children, it may be well to mention some errors in diagnosis, which have been made by men of established reputation in the profession. B. Bell states, that Cheselden lithotomised thrice and found no stone; Dupuytren mentions his having cut a child aged two and a half years, without finding a stone; and M. Roux says, that he has operated four times where there was no stone. Crosse admits that the same thing happened to him in one instance in a child under two years, affected

with polypus of the bladder; and states, that he has notes of not less than eight cases, in which persons have operated expecting to find stone where there proved to be none, occurring to practitioners within his own sphere, to several of which he was an eye witness. The same error was committed by Desault and others. The late Dr. Physick, than whom there never was a more cautious practitioner, says: "I was once very near committing this mistake; I sounded a patient, and had no doubt but that he had stone; his health, however, was bad, and I did not operate. He died soon after, and upon examination we found no stone."]

In order to discover a stone readily, the bladder should contain a certain quantity of fluid, neither too much nor too little, —say from five to eight ounces—as much, in fact, as will fill the posterior fundus. If the patient have not emptied his bladder for an hour or two, the sound may at once be introduced. If the bladder has been emptied, or if difficulty is felt in exploring the cavity, then a sufficient quantity of tepid water should be injected through a catheter with a properly adapted syringe or gum-bottle. The patient is laid in the recumbent position, with the pelvis somewhat raised, on a couch of a convenient height. The silver catheter, with a short and sudden curve, is sometimes used for sounding; but it is better to withdraw this, if it has been introduced for the purpose of injecting the bladder, and substitute a solid steel sound of the same shape. The posterior fundus can be better examined with a short beaked instrument, than with the old-fashioned long curved sound. The surgeon, placing himself on the right side of the patient, enters the sound, warmed and smeared with liniment, into the passage with its convexity towards the left groin; having passed it down to the sinus of the urethra, he gradually turns the point towards the triangular ligament, bearing along the upper surface of the canal, and then, by depressing the handle and pushing the instrument upwards in the axis of the bladder, he reaches its cavity. After a slight

pause, to quiet and reassure the patient, he proceeds methodically to examine into the state of matters. He may in all probability at once strike the stone, and feel and hear it without difficulty. This is likely to be the case if the foreign body is of considerable size; but if small, some care and dexterity in the manipulation will be required to detect it. Each side of the posterior cavity is examined, by turning the sound, and carrying it by gentle motion from the borders of the prostate to behind the entrance of the ureter. The point of the instrument can, by depressing the handle, be turned from one side to the other so as to sweep the fundus thoroughly: should nothing still be felt, the history being perfectly satisfactory, the patient having suffered at least many months under the symptoms, and these being strong and well marked,—it may be advisable, in order to be in a condition to give a decided opinion, to change the attitude of the patient; to make him get into the erect position, stooping forward considerably, and straining as if to empty the bladder. It may be proper also to withdraw the sound, and introduce a catheter to empty the bladder. The stone, if one exists, will then probably drop upon the instrument, and be felt distinctly. Should the symptoms persist, and no other cause be suspected or discovered to account for them, a second careful examination may be instituted. When stone is discovered, an estimate must be formed of its size; in order that, by taking this and the condition of the parts into consideration, a proper decision may be formed as to the most safe proceeding for its removal.

LITHOTRITY, &c.

Until within the last twenty years, surgeon and patient had no choice as to the mode of effecting a cure of stone; there was a choice certainly as to where the incision should be made, whether above, before, or behind; but the stone had to be cut out somewhere—there was in this respect no alternative. In time many sufferers under the disease bethought themselves of means to remove the foreign body, entire or piecemeal, through the natural passage; and some surgeons also turned their attention to the subject. The cases of the monk of Citeaux and of

Col. Martin, both of whom chipped off bits of stone by a wire passed along the urethra, are well known: and some very imperfect instruments had been imagined for entangling and cracking the stone, but never applied.

In the year 1820, a patient applied to Sir Astley Cooper, suffering from a number of small stones; and this eminent surgeon, feeling anxious to save him from the pain and danger attendant upon the operation of lithotomy, employed Mr. Weiss, sen., to make for him a pair of slender bent extractive forceps, which he could introduce along the urethra; and this instrument, at first rude enough, answered the purpose to a certain extent. It was afterwards, through Mr. Weiss's ingenuity and perseverance, made very perfect, and by means of it many concretions were removed from different patients by Sir Astley Cooper, Sir Benjamin Brodie, and other surgeons. After having had the clumsy ivory handle taken off those I obtained, and smooth metallic ones substituted, I used these instruments very successfully in a variety of cases, and in patients of all ages. But this method,—not very often applicable, and liable to many objections besides, such as the risk of entanglement, of laceration of the urethra, and of slipping the stone in the passage,—has been in a great measure superseded by the scoop and lithrotrite as now perfected and rendered safe and generally useful.

It appears that, so early as 1821, Mr. Weiss, having been led to reflect on the subject, had contemplated the possibility of breaking up a stone, and invented an instrument for the purpose, on the same principle as the one for extracting stones, and with the blades opening laterally. Not finding this to possess sufficient power, he, in 1823 or 1824, constructed an instrument, clumsy and imperfect, certainly, but on the same principle as the one so efficient, simple, and, on this account, so superior to all others, which is now manufactured by him, and used by many surgeons in this country. Previous to this, Dr. Civiale had devoted his attention to the subject of destroying urinary calculus, and contemplated the possibility of introducing some sort of pouch into the bladder, into which the stone might be received, and which would resist the action of chemical agents injected into it of sufficient strength to dissolve the foreign body.

By his dissections and experiments, he found that he could efface the curvatures of the urethra, and introduce without difficulty an instrument perfectly straight; in consequence he soon gave up the notion of using solvents, and contrived an apparatus, consisting of three branches in a canula, which, when thrust out, were expanded so as to grasp the stone; and to this he adapted mechanical means for acting upon the body so seized and held. Drills of various kinds were passed through a second and internal canula, the split ends of which formed the litholabe or forceps; and these were put in motion by a drill-bow, the whole apparatus being secured in a vice or mortice. In the year 1827, when lithotripsy was yet in its infancy, I witnessed the operation, through Dr. Civiale's polite attention, on some of his private patients; and, having provided myself with a complete set of his instruments, on my return attempted to break down the stone in some cases. It was soon evident to me, however, that the operation thus practised was to be relied on in but very few cases,—when the stone was very small and very friable, the bladder being at the same time capacious and not irritable. My first patient, after submitting to four or five sittings, (vide case in Edinburgh Journal, vol. xxx. p. 222,) determined on having the stone cut out; this was done, as he said, with less pain than that attendant upon any one of the grinding operations, and in a twentieth part of the time; he recovered without a bad symptom. The stone, which was hard, flat, oval, and not very large, had been well acted on by the drill, being perforated at several points, and indented besides on the edges; but it was plain that twenty or thirty such sittings must have taken place, before there could have been a possibility of entirely reducing it. The bladder was beginning to get very irritable, and every sitting would have been more and more painful and intolerable. Besides, the possibility of removing the whole of the fragments, from a bladder contracted and irregular on its inner surface, would have been more than doubtful.

In 1828, however, the case related at page 483 was most successfully managed by the same apparatus. Mr. Guthrie also made an attempt, in 1827, to break down a stone in a patient at the York Hospital: he used a modification of Civiale's

instrument, but without success; and I believe great difficulty was experienced in disentangling the apparatus, and withdrawing it from the bladder. In a few cases, which appeared favorable, I still persevered in attempts to grind down the stone, and in some of them relief was afforded. In one instance, after having, as was supposed, by two operations reduced the foreign body to a small size,—a good deal of detritus having been passed,—the stone was seized by the urethra-forceps of Weiss; it was then withdrawn without difficulty from the bladder, but slipped from the grasp of the instrument in the sinus of the urethra; it was impossible to seize it again in this situation, and besides it was too large to pass forwards; it was accordingly fixed by the finger and thumb of one hand, cut upon in the mesial line, and turned out without difficulty. The marks of the drilling are plain enough also upon this stone, somewhat larger than a haricot bean. The patient made a good recovery. But, besides the difficulty of seizing the foreign body, the risk of entangling and injuring the coats of the bladder, and the inefficiency of the means of reducing the stone to fragments,—this operation with the straight three-branched instrument was liable to objection, in consequence of the injury thereby inflicted on the neck of the viscus. It was impossible to guard against bruising the posterior part of the prostate, or of the veru-montanum, in shutting the forceps by drawing them within the canula; and this not unfrequently gave rise to great irritability of the parts, and to enlargements and even abscess of the testis; the patient was thus subjected to great suffering and danger, and the progress of the cure retarded.

In 1829, a professed lithotritist arrived in this country, bringing with him Civiale's instruments somewhat modified, and rather more complicated; in the use of these he had, it appears, acquired considerable dexterity. In 1831 or 1832, a second professor appeared; and for some time it was maintained that almost every case of stone could be disposed of satisfactorily by the boring and grinding process. It was tried extensively, and, after many miserable and painful failures, utterly disappointed the hopes of its advocates. When the operation was about to be abandoned, a new and favorable impulse was given to it by

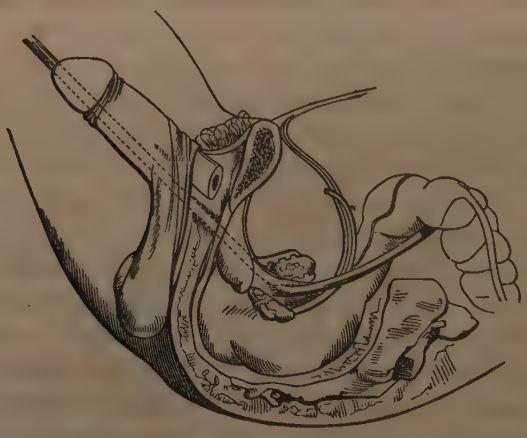
Heurteloup; he took the idea, it is said, from Weiss's second instrument, and copied this; but, instead of the screw, employed a hammer to force together its blades upon the foreign body; a strong bed was accordingly found a necessary part of the apparatus, upon which the patient was strapped and buckled down, with a vice attached to hold the instrument during the hammering process.

All these complications have now been thrown aside; and the "percuteur courbe à marteau," as it was called, has given place to the instrument which, by the Messrs. Weiss's perseverance and ingenuity, has been brought to the utmost state of simplicity and perfection. Whilst Mr. Weiss, jun., has been steadily proceeding in improving the instrument, so as to render it more safe and efficient, he has listened to such hints as have been offered; he has, at my suggestion, I believe, improved the handle, making it now of metal, and smooth, instead of being covered, as formerly, with ivory or wood made rough. The contact with the foreign body is thus rendered much more distinct, and greater facility afforded in seizing the stone. At the suggestion of the late Mr. Oldham, a gentleman attached to the Bank of England, he has also adopted a most essential improvement, without weakening the instrument; the outer or anterior blade being now made open, so as to receive the other. The clogging of the instrument is thus effectually prevented, the fragments being readily forced through the fenestrum. The extremity of the instrument is here represented, embracing such a stone as

may safely be attacked by it. In operating in the Edinburgh Infirmary with the percuteur, afterwards with the same instrument worked with a rack and pinion, and at a still later period with Segalas's screw lithotrite, the greatest inconvenience imaginable was experienced from the impossibility of closing the blades perfectly. The beak of the instrument, in its withdrawal, was brought to the orifice of the urethra filled with detritus; but from thence it was found an exceedingly difficult matter to disentangle it. In one or two instances it was found necessary to slit open the meatus with a bistoury; and in each instance the patient suffered as much in this part of the operation, as he would have done in submitting to cystotomy and extraction of the stone. In fact, a host of practitioners, together with the pupils of the hospital, had more than once an opportunity of making the comparison as to the apparent suffering which patients underwent—the operation of lithotomy having been repeatedly performed on the same day as lithotrity. Their decision was then rather in favour of the cutting operation.

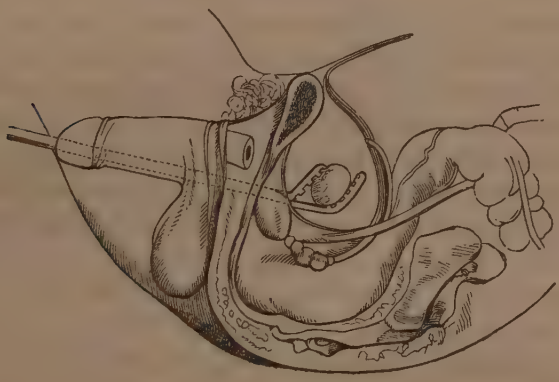
Since that period, however, the operation of lithotrity has been much improved and simplified in all respects; it is applicable now to a great variety of cases, and is likely, in a few years, to supersede in a great measure the operation of cutting for stone. Until very lately, patients applying to surgeons were constantly recommended to submit to the knife, in order to get rid of stone in the bladder, whatever might be the size of the concretion, or the state of the urinary organs. On the other hand, if he fell into the hands of the grinder, no matter what the peculiarities of his case, he was as certain to be subjected to the boring and hammering processes. Now that the merits of both operations are better understood and appreciated,—some few surgeons having thought proper to turn their attention to the matter, and study and understand lithotrity as well as lithotomy,—patients have a chance of being treated judiciously and conscientiously, and of having that proceeding resorted to which is adapted to the circumstances of their respective cases. I was not slow to adopt the operation of crushing, have always had a favorable impression of it, and have throughout used the same language regarding it; yet I have the credit of being an oppo-

nent of lithotrity. I have all along been, and am certainly still, opposed to the abuse of any one operation, by its indiscriminate employment in all cases, and by its being practised by those alone who know no other. It can be employed safely only by those who understand well the healthy anatomy of the urethra and bladder: who are acquainted with their sympathies, vital actions, and pathological changes; and who both understand, and are in the constant habit of treating, derangements of their functions. The operation of lithotrity is applicable to patients above the age of puberty, when the symptoms have not endured very long; when the foreign body is ascertained to be about the size of the one sketched at p. 492,—measuring six or seven lines, or even more perhaps, say as large as a chesnut; when the bladder and urethra are in a tolerably healthy and normal condition,—as indicated by the power to retain the urine comfortably for several hours, and to pass it in a tolerably free stream; and when the viscus admits of injection and a careful exploration. That the stone may be seized readily, and acted upon without danger to the lining membrane, the bladder should contain at least five or six ounces of fluid. The patient is placed upon a couch, with the pelvis raised upon a firm pillow; a catheter is introduced, and a sufficient quantity of tepid water injected by means of a syringe properly fitted to it, as recom-



mended in treating of sounding. The catheter having been withdrawn, the screw lithotrite is introduced, the whole bent part being received within the cavity of the bladder; and it is then carried to the usual situation of the stone, by raising its handle.

The one blade is slid back on the other, so as to expand them; they are then moved slightly, and the stone seized, as represented p. 494. This is done with all due caution; and it is ascertained that there is no entanglement with any fold of mucous



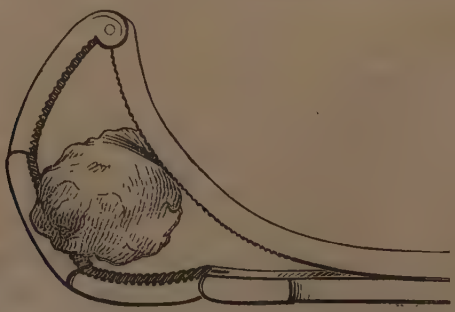
membrane, by raising the point gently; the instrument is then brought towards the neck of the viscus into the position here shown, and the stone there acted upon. The pressure is applied at first gradually, the screw being alternately turned forwards and backwards. The yielding of the foreign body is felt, and even heard; and it is disintegrated and crushed, as certainly and more safely thus than by the use of the hammer; some of the instruments are made so that this latter method of approximating the blades may be employed in addition, but that part of the proceeding must soon fall into disuse.

Many very distressing accidents occurred in the operation with the "percuteur à marteau." The instruments were repeatedly broken or bent; or they were clogged in such a way that it was found impossible to shut and disentangle them, so that they might be withdrawn. In resorting to the hammering process some years ago, I had fully made up my mind to use

very moderate force in closing the blades; but at the same time, lest an accident should occur, I had bethought me how to remedy it. Some cases had been reported in which, when the instrument could not be withdrawn, incisions had been made, followed by attempts to bend back the blades, by the introduction of strong forceps. This appeared to me a very cruel and clumsy proceeding. I had determined, should I meet with any case of the kind, to pull forward the instrument as far as possible, so as to bring it into the neck of the bladder and close to the triangular ligament, then to push down the penis upon it, and protect the glans with a piece of split card or strong leather; the stalk of the instrument was then to be seized with a hand-vice, and cut through as low as possible; it can be done within two inches and a half of the commencement of the curve; there would be no difficulty in then pushing the blades containing the stone back into the bladder, and cutting them out together. This proceeding I had ascertained to be quite practicable by trials on the dead body; an account of it is given in an abstract of a surgical lecture in the "*Lancet*," vol. i. 1835–36, p. 159.

[The "brise pierre articulé" of Jacobson is the instrument generally made use of in this country, and is that which we would give a preference to. It combines great power of action with delicacy of form and structure, and if by accident it should be broken, an instance of which I am not aware of ever having happened, it may be withdrawn without that difficulty which has occurred with the instrument of Huerteloup. Besides this it can seize as large a stone as the instrument above described, is not so liable to pinch the bladder, catches more easily, and holds firmly the calculus when included.

The annexed cut represents the instrument embracing a stone.]



The fragments may be taken up and operated upon, one after another, by the same instrument; if the patient has not suffered much, the screw-scoop may be substituted at the first sitting, an instrument of the same form, but with a smaller opening in the anterior blade; with this, some of the broken portions may be laid hold of, crushed, and extracted. In this way,—at one operation, if the stone be small,—the cure may be completed without effusion of blood, and with very little more pain than is caused by the introduction of a bougie. A small quantity of blood occasionally passes with the urine and injected fluid, probably from the posterior portion of the urethra being stretched and made straight, and compressed at points owing to its curvatures being effaced. There may also be a little overstretching of the orifice, in spite of every care in forcing the two blades in contact by the screw. The detritus does not pass readily for a few days, until the water is again evacuated in a full stream and in quantity. Diluents are given freely; and opiates may be exhibited by the mouth or lower bowel, and general or hip-baths used, if symptoms arise requiring such practice. Should any great excitement about the neck of the bladder take place, with frequency and pain in micturition, it may be necessary to abstract blood from the perineum. In general, however, the disturbance is slight, if any; a farther examination can be made in six or eight days, and such fragments and detritus as remain, are then to be dealt with according to circumstances. A very few sittings will suffice to rid the patient of such a stone as it is advisable to attack in this manner. Mr. Key has lately recommended the addition to the lithotrite of two wings with nets attached, into which he proposes to receive the stone, and by that means to throw the broken portions again and again within the blades as they are opened, so that they may be, at once, more certainly and effectually triturated. The machine is very ingenious and pretty, but impressed as I am with the truth of the maxim with which this volume is commenced, I cannot approve of the proposal; a proceeding which has been gradually simplified and made of safe and easy application, would be thus again rendered

complicated, precarious, and more difficult than ever in execution.

When the stone is much larger than above indicated, and when the bladder, in consequence of the endurance of the irritation, has become contracted, fasciculated, and irregular on the surface, presenting the rudiments of pouches, it will be absolutely impossible to make sure of removing all the detritus. Nuclei must be left, and very shortly the patient will have five or six stones substituted for one. The suffering and danger, moreover, endured by the patient at each sitting,—when these are often repeated, in an unsound bladder, for removal of the fragments of a large concretion,—are much greater than those resulting from a speedy and well-conducted, safe operation for its removal, entire and at once. By lithotomy the excited state of the bladder is relieved by the removal of all source of irritation, by the viscus being put at rest, and its functions suspended, and by the loss of blood from the neighbouring vessels.

In lithotrity, on the other hand, when the stone is large and considerable fragments are left, the irritation is greatly increased. The pain experienced in passing fragments is often extreme, and not unattended with danger; for difficulty is often experienced in dislodging portions from the urethra. Then retention follows, perhaps, with inflammation of the bladder. The pieces of stone may sometimes be dislodged by the use of a scoop, with or without a second blade; and such an instrument has been made, at my suggestion, by Mr. Weiss. But occasionally their size renders it impossible thus to get rid of them; and then incision of the perineum in the mesial line must be practised, and that early, in order to save the patient. I have been obliged to resort to this proceeding; and then I did not hesitate to carry the incision a little farther, and take the liberty of clearing the bladder by the use of the scoop and finger. Blood too is often lodged in the bladder and removed with difficulty. The excited action which follows is, perhaps, at first, slow and weak; but it soon becomes lighted up by the continued irritation resulting from the frequent contraction of the viscus

and contact with the angular pieces of the concretion. Unless a very correct judgment is exercised in determining upon the practice in particular cases, and great gentleness observed in the manipulations, fatal results must very often follow. Otherwise, the termination, like that in the case of a woman undelivered, is very unsatisfactory.

The operation of lithotomy must yet continue to be performed on children, and on those of mature age who are so ill-informed or foolish as to permit the stone to attain an inordinate bulk. The concretions in young subjects are generally composed of a very dense substance, the oxalate of lime, in whole or in part; and the urethra is often so narrow as to preclude the application of instruments strong enough to reduce them. The reasons for giving a preference to incision over crushing, when the stone is large, have been already given.

[Reports, recently made, have clearly shown that crushing of the stone is applicable to many of the cases which occur in children. Nor is this so extraordinary as at first sight it might appear, when it is recollected that the urethræ of children suffering with stone are generally preternaturally large, and admit readily the introduction of instruments of a comparatively large size. M. Segalas has made known five cases in which this operation was practised in them with perfect success, viz., in a girl of three, and four boys of three, eleven, twelve, and fifteen years of age; the operation giving rise in none of them to serious accidents. The girl and boy of three years old, were operated on with the "pince à trois branches;" in the other, the "brise pierre à pression et à percussion" was used. In this country, the success of lithotripsy in children, in those cases in which it has been tried, has been highly gratifying. Professor N. R. Smith, of Baltimore, has used it in five male children, the ages of whom were, respectively, seven; two years and nine months, seventeen, seven, and one of one year and ten months; the latter being the youngest child ever operated on by this method. In all of these, the instrument of Jacobson, adapted to the size of the patient, was employed; and in all of them, the cures were soon obtained without the occurrence of any violent symptoms. Dr. Randolph of this city, has also made perfect cures in a little girl of four, and a boy of thirteen years of age.]

LITHOTOMY.

The operation of lithotomy, when the patient's health is tolerably good, his kidneys sound, and other circumstances favorable—is very satisfactory in its results, when properly performed with few and simple instruments. The incision of the perineum, and of the prostate to a limited extent, is to be preferred in almost every case. The operation on the gripe and the recto-vesical method, are not now in the list of regular and established operations. The operation above the pubes, still practised occasionally, is not to be resorted to from choice. If a stone, of such a size as could not pass readily through the outlet of the pelvis, were ever met with, the high incision might be thought preferable. Also, an opening made in this situation for the relief of retention, at some former period, has been dilated for the removal of concretions; and this may be done with great safety, the parts around being condensed. Indeed, puncture of the bladder in this situation has even been proposed by an old and very diligent pupil of mine, Mr. G. Bell, as a preliminary step to the high operation.

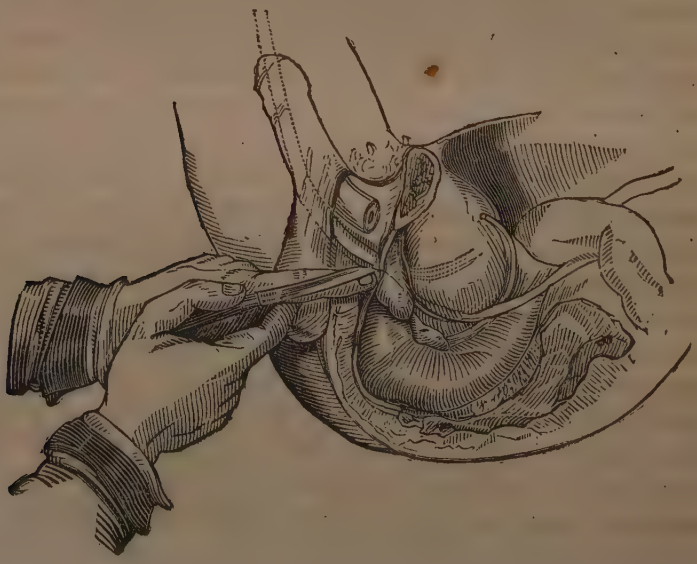
The cases in which the perineal incision cannot with certainty be resorted to, are rare indeed. When the patient's health is otherwise good, the only preparation for lithotomy consists in unloading the bowels; and it should be so arranged, if possible, that the action of the medicine shall have ceased some time before the time of operating. The operation which I have been, and am still in the habit of performing, is conducted in the following manner. It is much after the manner of Cheselden's improved operation, and that of many other good lithotomists, and has, at least, the recommendation of perfect simplicity. The position of the patient is properly secured so as to present a full view of the perineum, previously shaved. A boy is conveniently held on the knee of an assistant, who grasps the legs in the middle and separates the thighs. In the adult, it is absolutely necessary for the patient's safety, and for the success of the operation, that the limbs should be favorably placed and so retained, in order to afford every facility to the surgeon.

This should be attended to with great care, the palms of the hands being applied to the soles of the feet, and so fixed by proper bands that there shall be no risk of their slipping; an additional band should also be passed under the hams, over the shoulders, and secured behind. An assistant, on each side, separates the thighs, and keeps down the pelvis on the table; and this should be firm and steady, not over high, and covered with a folded blanket. The shoulders are very slightly raised, the trunk and pelvis being as nearly as possible horizontal. Much outcry has been made against the preparations and precautions here described; yet they are quite essential to the success of the operation,—to its being completed satisfactorily, and in a reasonable time. The professed and exclusive lithotritists, and their advocates, did not hesitate to rail against the "binding of victims," at the same time that they were in the habit of fixing their patients upon their "lit rectangulaire" by straps over the pelvis and round the shoulders, and still farther by screwing an instrument to the bed by a vice, with one end hooked into the bladder. And this was not all; for the unfortunate individual, thus helpless, bound, and screwed down in a most uncomfortable position, was often shaken, jumbled, and turned heels over head, by suddenly knocking the feet from under this bed or operating-table.

Before the patient is secured for lithotomy, it is advisable to introduce a sound,—in order to make perfectly certain of the presence of the foreign body, more especially in children, whose screaming is apt to interfere with the examination; and it is proper, also, that those who assist should be equally satisfied at that time, as the operator. This may in the majority of cases be effected by the introduction of the grooved staff, which is to serve as a guide for the knife in its entrance to the neck of the bladder. The staff is more readily passed before the thighs are elevated; the one which I have always used, is of rather large size, and grooved deeply betwixt the lateral and convex aspects. This instrument is easily felt after the first incision, and the urethra opened upon it. It is hooked against the symphysis and entrusted to an assistant, with directions to maintain the position steadily from first to last, neither to turn it so as to

bulge in the perineum, nor to depress the handle as the knife enters the bladder; the surgeon's left hand is thus left at liberty, to guide the knife and guard important parts from danger.

The staff having been passed, and arrangements made as to its being properly held, the operator should ascertain that the rectum is empty, by introducing the fore-finger of the left hand. The knife, represented below, is then entered freely into the perineum, about an inch, more or less, behind the scrotum, and is made to cut downwards and outwards through the skin and superficial fascia, in a line about midway betwixt the tuberosity of the ischium and the anus, and, beyond that orifice, towards the sacro-ischiatic ligament. The fore-finger of the left hand is then placed in the bottom of the wound, about its middle, and directed upwards and forwards; any fibres of the transverse muscle, or of the levator of the anus, that offer resistance, are divided by the knife, with its edge turned downwards; the finger then passes readily through the loose cellular tissue, but it is resisted by the deep fascia, immediately anterior to which the groove of the staff can be felt thinly covered. The point of the instrument is slipped along the nail of the finger,



and, guided by it, is entered into the groove at this point, with its back still directed upwards. The finger all along is placed so as to depress and protect, as much as possible, the coats of the rectum. The same knife, pushed forwards, is made to divide the deep fascia, the muscular fibres within its layers, and a very small portion—not more than two lines—of the urethra, anterior to the apex of the prostate, together with the prostatic portion of the canal, and the gland to a very limited extent. The commencement of this second incision, and the position of the hands and knife, are shown on the opposite page in a very correct sketch of the viscera of the pelvis, with their relative size and position. The drawing of the anatomy of this sketch was made, with the utmost degree of care, by Mr. Bagg, jun., from nature, and from dissections made by my excellent friend Mr. E. Wilson. The external incision cannot be too free, within certain bounds. No purpose can be served by dividing the scrotum or the integument of the hip; nor is greater space gained, by cutting any muscular fibres in addition to those of the transverse and levator ani, and those surrounding the membranous portion. But the internal incision must be very limited indeed; it should certainly not extend beyond six or seven lines from the urethra outwards and downwards, as marked on the sketch; for the less that is cut, the greater will be the patient's safety. The object, in following this method, is to avoid all interference with the reflexion of the ileo-vesical fascia from the sides of the pelvic cavity over the base of the gland and side of the bladder. If this natural boundary betwixt the external and internal cellular tissue is broken up, there is scarcely a possibility of preventing infiltration of urine, which must almost certainly prove fatal. The prostate and other parts around the neck of the bladder are very elastic and yielding, so that without much solution of their continuity, and without the least laceration, the opening can be so dilated as to admit the fore-finger readily; through the same wound, the forceps can be introduced upon this as a guide; and they can also be removed, along with a stone of considerable dimensions, say from three to nearly five inches in circumference, in one direction, and from four to six in the largest.

But to proceed with the details of the operation;—the finger follows the knife, which is then withdrawn; and the position and volume of the stone can be at once distinctly ascertained, in the greater number of cases. Occasionally, if the patient is very corpulent, unmanageable, and badly held,—or if the prostate is rigid and very large, the bladder being thus removed from the surface of the perineum,—it may be difficult to make the internal opening fully and with precision. In such cases, it may be prudent, after dividing the membranous and prostatic portions of the urethra, to lay aside the knife, and to introduce gently a gorget with a bluntish edge, such as was used by the late Mr. Martineau of Norwich, and is still employed very satisfactorily and successfully by his successor, Mr. Dalrymple. The opening in the bladder will thus be enlarged smoothly, and to a sufficient extent. I have never, as yet, used a gorget; but in such a case as the one described, and which is sometimes presented, I might now be induced to make trial of it. By the careful use of the finger, I have always attained my object, without much delay or difficulty. If possible, and it almost uniformly is so, the stone should be felt with the finger before any instrument is introduced, or any attempt made to seize it. The position of the foreign body can thus be changed, if necessary, before all the urine escapes, and the certainty of seizing it at the first attempt is much increased. The forceps, suited to the shape of the stone, thus also ascertained, are guided by the finger; they are brought into contact with it shut, one blade is then slid underneath, as it lies in the posterior fundus, the handles being somewhat elevated. The instrument is then closed gently; and the point is raised and brought towards the external incision, before any attempt at extraction is made. Careful examination with the finger is now proper, as regards the position in which the stone is held; and, if necessary, that is altered to one more favorable. The handles are then depressed, and the extraction made in the direction of the axis of the pelvis.

The seizing and extraction of the stone constitute, without doubt, the most difficult part of the process. The facility of accomplishing it will depend, in a great measure, upon the pre-

liminary steps, particularly the position and size of the opening; but even although these have been tolerably well attended to, difficulty will often be felt by a young and inexperienced surgeon in this part of the proceeding,—in accomplishing the object, for which, in fact, the operation is undertaken, and upon the satisfactory attainment of which, the future comfort of the patient, and the reputation of the surgeon, must inevitably rest. Much delay has arisen in this part of the business, and not a few complete failures have occurred: this should not be; and it is equally the duty of the pupil to practise the seizing and extraction of the stone, as it is for him to study the relative anatomy so that he may be enabled to cut into the bladder with precision and safety.

It may have been suspected by the surgeon, on sounding, that the stone he has to encounter is of large size, and his suspicions may have been fully confirmed by examination with the finger through the incision. If above a certain size, it is impossible to bring it through an opening on one side of the prostate such as described, without bruising and laceration of the parts; it will then be proper to provide more room for its exit, and this is gained by making a similar incision on the opposite side of the neck of the bladder. This is done by passing a narrow-bladed and blunt-pointed bistoury along the finger, and directing its edge towards the right tuberosity of the ischium. If the external incision has been well planned, properly made, of sufficient extent, and low in the perineum, there is no occasion for any farther division of the skin and superficial parts. No complicated machine is required to make this bilateral division; and it is quite time enough to have recourse to it, when the necessity has been fully ascertained to exist.

The single lateral incision affords sufficient room for removal of the stone, in nineteen cases out of twenty; and there can be no purpose served, therefore, in always making a cut in both sides of the gland, and thus endangering the emasculation of the individual. In removing large stones, sufficiently long forceps must be used. The extraction, after the stone has been satisfactorily grasped, must be made in the right direction, slowly

and deliberately; the instrument is moved forwards and backwards gently, so as to dilate the parts, and these are pushed back, as it were upon the stone, by the fingers of the left hand, whilst the extracting force is kept up. Forceps without teeth, but lined with coarse linen on the inner surface of the blades, will be found more serviceable than those in common use. With them the stone can scarcely be slipped, and there is less risk of chipping it. Some stones are so exceedingly brittle, that, even with the utmost care, their giving way and crumbling down cannot by any possibility be prevented.

Again, some smaller stones may be present, along with the principal one whose size has led to the necessity for the cutting operation. In such cases, the scoop will be found a most useful adjunct to the apparatus. With that instrument and the finger, fragments, or small concretions, can be secured, and brought out quickly; there is seldom any necessity for washing out the bladder. The cavity is cleared with great care; and if the fragments into which a stone has broken are large, they can be put together so as to reconstruct the stone, and thus make sure that they have been all extracted. The cavity must be explored with the scoop or searcher, (a sound with a bulbous extremity,) passed by the wound; and the flow of urine is afterwards encouraged by diluents. It will always be prudent in such cases to make a second examination through the wound before it has contracted much, whilst yet the urine passes off freely in that way, when the parts are relaxed, and their sensibility somewhat abated.

If the incisions are placed low, as recommended, and the knife used cautiously in the deep incisions, there will be no trouble from bleeding. The artery of the bulb, which is often cut from want of care, and furnishes blood very freely, will, I believe, be quite safe in this mode of proceeding, whether it follow the usual course or not; as will the pudic itself, whether it lie protected by the ramus of the ischium, or come from the internal iliac direct, without passing behind the lesser sacro-ischiatic ligament. In making the incisions on a straight staff, it is admitted, by the keenest advocates for the practice, that it

is a very difficult matter to avoid wounding the artery of the bulb; and the bulb itself must always be cut to a greater or less extent. The same accident must happen, in using some of the strangely crooked staffs that have been of late re-invented. The smaller vessels, the transverse artery of the perineum, and branches of the hæmorrhoidals, soon cease to bleed. Out of considerably above a hundred patients, on whom I have performed the lateral operation of lithotomy, only one, an aged man, suffered in consequence of hæmorrhage; in him the artery of the bulb was untouched, but the branches of the hæmorrhoidals were loaded with earthy matter, and incapable of contracting or retracting.

After the bladder has been cleared of the foreign matter, it is advisable, in my opinion, to introduce a gum-elastic tube, and secure it by tapes to a band round the waist, with a view of favoring the flow of urine, preventing its infiltration, and thus insuring, as far as possible, the patient's safety. The tube varies in length, from three to six inches, and in size also, according to the age of the patient and depth of the perineum. It is kept clear of coagula for a few hours: its presence occasions no inconvenience, and when the urine comes away plentifully and clear, through the canals, and by its side, as it generally does in a few hours, all danger is nearly passed. The presence of this canula in the whole track of the incision affords great facility for arresting any oozing that may arise from vessels, either arterial or venous. The latter, about the neck of the bladder in old people, are often much enlarged, forming a plexus, and should properly not be interfered with; they furnish, if wounded, a good deal of blood; and if the parts about the neck of the bladder are disturbed and lacerated, or bruised by the rude and forcible use of forceps,—or if urine is admitted to these open vessels, its escape not being encouraged, as advised,—inflammation of the coats, attended with very serious danger, is apt to ensue. The oozing from small vessels, if it persists, can readily be arrested by pushing some pieces of lint with a strong probe along the tube, which of course is then kept carefully pervious. To the employment of this tube I am much inclined to attribute the successful result of many cases in which I have

been concerned; much anxiety and risk is thereby removed, and its presence never can do harm.

My old friend Mr. Crichton of Dundee, who has had a good field for experience in these diseases, and who has performed the operation of lithotomy about as often as any person now alive in these islands, seems inclined to recommend immediate closure of the incisions. One or two young patients have, in his hands, made very rapid recoveries; and, by chance, little or no urine has passed by the wound. This he calls a cure by the first intention, and his desire is to promote it in the majority of instances, if not in all. He does not say how the object is to be attained; nor has he brought any proofs of the superior safety of his method, even admitting that it were practicable. Cessation of the flow of urine by the wound is always an alarming circumstance, leading to suspicion and apprehension of mischief. Stoppage of the secretion, and escape of it into the deep cellular tissue, are almost equally fatal. Mr. C., in his last paper on the subject, is inclined to be very severe on those who have tried, as much as possible, to do away with his favorite operation of cutting for stone by adopting lithotrity in favorable cases. He condemns a practice of which he has had no experience, and relates a case, in confirmation of his opinion, in which the stone had been broken and removed. The patient was in bad health, and emaciated. He sounded him repeatedly, but could detect no stone. I believe, though it is not stated in the communication, that I am the operator to whom he is disposed to attribute blame. The case, however, speaks well for lithotrity. The patient was not in good health when he was admitted into the Edinburgh Hospital. There was reason to suppose that his kidneys were not sound. He was not in a favorable state for any operation, certainly not for lithotomy, and to this he had a decided objection. Indeed, he had fully made up his mind not to submit to be cut, had it been proposed to him. The stone, of considerable size, from eight to ten lines in diameter, was broken down by the "percuteur à marteau" at repeated sittings. The patient was relieved, and, as it appears by Mr. Crichton's own showing, was cured of stone in the bladder. It is questionable, had Mr. C. been first applied to, and more especially had he tried his

method of cure by the first intention, if any opportunity of sounding repeatedly would have been afforded many months after the first manipulations.

The tube is removed so soon as it is reasonable to suppose that the cellular tissue has been closed by plastic effusion. In children it need not remain above twenty hours; in patients advanced in life, and of lax fibres, it had better be retained for forty or fifty hours at least. Immediately after lodging the tube in the bladder, the finger is passed into the bowel to ascertain that all is safe in that quarter. The rectum has been wounded, though perhaps slightly, even by the best operators, and the struggling of the patient is made sometimes to account for the accident; it should not happen if the surgeon is well assisted; but if it does, some remedy must be adopted. The urine will continue to flow in part by the rectum, and a natural cure cannot readily take place. The earlier the sphincter of the anus is divided, as for the cure of the complete fistula in ano, the better will be the patient's chance of being freed from the annoyance.

Cases are occasionally presented in which a previous operation has been performed. The former wound may not have closed entirely, and the parts are condensed and rigid. The surgeon must be guided by the circumstances, in deciding upon his line of proceeding. He may dilate the original opening, cutting on the finger among the altered structures, and guided, of course, by a staff in the urethra; or he may make fresh incisions on the right side of the perineum. He will adopt this latter course, when the previous wounds have perfectly closed; and in that case, the staff must be grooved on the opposite side, so as to point to the tuberosity of the right ischium. The incisions are deliberately made in the same way, under the same guidance, and of the same extent, both in the superficial and deep parts. I have had occasion to perform this operation in three or four instances, and have found no difficulty in reaching the bladder, or accomplishing removal of the stone; and all these cases terminated favorably.

The operation of lithotomy, about which so much dread has lately been excited and fomented by interested persons,—and which certainly, according to the complicated methods, was for-

midable and not over-successful,—if performed in the very simple and easy method recommended, is effected with much less pain than is supposed; it is completed with perfect safety in a short space of time, and offers very favorable results. It is, however, an operation that never ought to be undertaken without due consideration of all the circumstances that may arise; and the surgeon who does undertake it must have resources within himself sufficient to encounter and overcome difficulties in all the various stages of the proceeding. Were the circumstances of all cases precisely similar as regards the depth and resistance of the parts, the size and consistence of the prostate and of the foreign body, the capacity of the bladder, and the width of the outlet of the pelvis, then the operation might always be completed in a given time with certainty, and in the same manner. But it is not so; unforeseen obstacles occur, from first to last, and the operator must make up his mind to proceed in all cases with the greatest caution and deliberation; he must commence with a determination to finish his task safely and well; and he will also accomplish this quickly, when the state of parts is favorable, and nothing unusual intervenes.

A case occurred to me, very lately, in which difficulties that could not have been expected were encountered. A boy, of about six years, was brought to me by Mr. Wadsworth, Broad Street, Golden Square. He had only just arrived from a distance in the country. A sound was introduced without difficulty, and a stone discovered. His health was stated to be good, and his bowels in proper order. He had some medicine given him; and, a few mornings after, on proceeding with Mr. W. and his partner, Mr. Russell, to cut him, on turning up his perineum, a plaster was found applied to it. There was great induration of all the parts around a large perineal abscess, which had opened imperfectly. A free incision was made through it, towards the neck of the bladder; and this was reached with some difficulty, in consequence of the rigidity of the tissues. It was opened, and a stone of considerable size grasped. It was friable, and although, in the natural state of parts, and with some delicacy and care in manipulation, it might, perhaps, have been brought out entire, this could not be effected in their al-

tered and unhealthy condition. Accordingly, it had to be removed piecemeal by the use of the scoop. The proceeding, which would, in ordinary circumstances, have occupied less than a minute, was thus necessarily protracted to six or eight.

Calculi are sometimes lodged in different parts of the urethra. They may be so situated, behind a contraction in the posterior part of the canal, or within the meatus, as to obstruct the flow of urine. If not large, and its escape from the bladder very recent, it may be possible to bring the foreign body forwards by pressure with the fingers on the perineum, assisted by the straining efforts of the patient. By means of a small scoop, it may be extracted from the orifice, perhaps after a slight division. But, often, stones of a larger size are lodged and so impacted in the passage, that there is no possibility of moving them; they may have remained in the same position for a number of years, acquiring additional bulk, and rendering it at last necessary to cut down upon and remove them. This can always be done without difficulty, and with comparative safety.

Four or five years ago, in the Edinburgh Hospital, I cut out five or six stones formed on pieces of straw from the sinus of the urethra of an old man, from whose bladder I had extracted a large calculus at least ten years previously. He laboured under stricture, when first under my care; this was relieved at the time he had lithotomy performed, but it appeared that, subsequently, difficulty in micturition arose. It is probable, that in the dilated part behind the stricture a small concretion had been subsequently either detained or formed; to displace this, and procure more free evacuation, he had recourse to the introduction of straws into the passage; and, in fact, I discovered him in the midst of one of his operations with this primitive sort of catheter, at the gate of the hospital, as he came to be admitted.

A very extraordinary case is detailed in the "Edinburgh Medical and Surgical Journal," No. 74, p. 57, in which I extracted a concretion rather large for the situation it occupied in the urethra. The patient, then approaching the age of fifty, had, as he stated, when a boy, pushed a small brass curtain ring over the penis till stopped by the scrotum, in order to prevent the urine from passing off during the night. The swelling

that ensued prevented its removal; he kept the occurrence secret; the tumefaction gradually abated, and the ring disappeared. But the hardened mass, which remained, increased in size; and, latterly, the functions of the parts, which had previously been very well performed, began to be disturbed. The foreign body was cut upon and removed. On making a section of it, the greater part of the ring was found forming the nucleus, as here seen. The continuity of the erectile tissue, which had thus been cut through gradually by the foreign body, was perfectly re-established.

It is always advisable, when possible, to bring calculi forwards to the orifice, and remove them thence by dilatation; if not, to push them back, and, at the same time, pull the scrotum forwards, so as to extract them by free incision in the perineum. Owing to the thinness of the coverings, it will be found a most difficult matter to close entirely any opening anterior to the scrotum.

DISEASES OF THE FEMALE ORGANS.

Irritating discharges from the vagina produce warts on the labium and nymphæ of the female, similar to those occurring on the glans of the male; they require a similar treatment. If there be much discharge from these parts accompanying the warts, a strong decoction of the tormentilla may be used with advantage. In elderly people, warts are occasionally observed in this situation, and which may degenerate into malignant ulcer, requiring free removal by incision of the surrounding parts, for their cure.

Swellings of the external labia occur from various causes. The solid œdema of warm climates has been alluded to in a preceding chapter—blows, falls, or severe bruising from any cause, may induce an effusion of blood similar to the diffuse hæmatocele of the scrotum in the male. If the parts be fomented and rest enjoined, probably the greater part of the blood will be absorbed; some, however, may remain, and form a small tumour in either labium, which is perfectly stationary for many months.

To get rid of this collection, it will be necessary to make a small incision into the labium and squeeze out the clot; but severe inflammatory action may follow injury of these parts, which, if not checked, will end in abscess; in the early stage, leeches, fomentations, and rest are required; when matter is formed it should be evacuated by early incision—as a result of abscess in this situation a sinus may form in the labium, and may continue to discharge for some time. Incision is not so necessary in the treatment of these sinuses, as in those situated near the anus. The sphincter of the vagina is not liable to such constant motion as that of the bowel. In these cases injection of sulphate of copper or zinc may be tried, or the more effectual means of putting a piece of potassa fusa into the sinus, and allowing it to remain for a few seconds. Should these means fail, it will be necessary to lay it freely open with a bistoury.

The clitoris is occasionally the seat of great enlargement, usually accompanied by great irritation of the genito-urinary system, and occasionally nymphomania; and these symptoms are sometimes removed by the excision of the unnatural growth. The urethra of the female is subject to a small vascular growth or caruncle, just within the meatus, which obstructs the flow of urine, and, if allowed to increase, causes considerable pain and inconvenience when the patient empties the bladder. These cases are very obstinate, and resist escharotic applications. The best mode of treating them is to seize the caruncle with a pair of artery forceps without the spring, having first dilated the urethra, and having drawn the growth well out of the urethra, to remove it with a pair of scissors, cutting the tissue as wide of the morbid structure as possible. If the vascular growth itself be cut into, hæmorrhage to an alarming extent may occur after the operation; and even when the parts are divided free of the disease, some bleeding takes place. If to any extent, this may be arrested by introducing a catheter into the bladder, and pushing up lint by its side so as to plug the urethra, and at the same time allow the escape of the urine from the bladder.

Gonorrhœa in females is a much less troublesome complaint than in males, and requires only astringent washes. Leucorrhœa is also a frequent disorder both in married and unmarried

women. It may be distinguished from gonorrhœa by the colour of the discharge; in the latter disease the stain on the linen is yellow, with a black border; in the former it is simply white or yellow. In both these diseases it is very important to examine the state of the upper part of the vagina with the speculum. In many cases after long treatment with astringent washes, &c., the discharge still continues. On the introduction of the speculum, some ulceration, either of the uterus or of the upper part of the vagina may be perceived. This should be treated with caustic, either in the form of the solid argenti nitras or a strong solution, and a speedy cure will follow this application.

Unnatural adhesions of the labia may take place in early childhood, from neglect of cleanliness producing excoriation; the labium becomes perfectly raw and granulating, and in healing, union takes place between the two labia; a small orifice may be left for the discharge of the secretions. In order to separate the labia and bring the parts into a natural state, it will be necessary to divide them in the mesial line with a knife to a sufficient extent, and prevent their future union by the interposition of dressing until the incisions are perfectly healed.

The hymen is occasionally imperforate, a circumstance of no consequence until the age of puberty. When that period comes on, the young girl will present all the accompanying symptoms of menstruation without the discharge, and these will recur at the stated periods; after some time the abdomen will begin to swell. Young persons in this state have been suspected of being pregnant. If the vagina be examined, a bulging tight membrane will be perceived in the situation of the hymen. A crucial incision should be made into this; and a quantity of thick grumous discharge will be evacuated; the patient will be quite relieved; she will menstruate in the usual way, and there will be no fear of the opening again closing. But a contraction or partial stricture may occur higher up in the vagina, and may occasion impediment to the passage of the child's head during parturition. I once had occasion to notch the sides of the stricture in such a case.

During parturition, from the long pressure of the child's head, or from the unskilful use of instruments, injury may be done

to the upper part of the vagina, and during recovery union may take place, and complete occlusion be the consequence. The discharges of the uterus are prevented from escaping; they accumulate, and great swelling of the uterus is the consequence. Attempts may be made to restore the passage. This is best done by placing the fore-finger of the left hand in the rectum, and with the other hand passing a trochar into the vagina and directing it upwards, guided by the finger in the bowel, towards the distended cavity above. If this be reached and the fluid evacuated, the canula may be left in the passage and its size further augmented by dilators.

One of the most distressing affections to which women are occasionally liable, is vesico-vaginal fistula. It is generally produced by long-continued pressure of the head of the child during parturition occasioning sloughing of the walls of the vagina after delivery, or from the injury done to the tissues in this situation by the rash attempts of practitioners to deliver by means of instruments. The patient is unable to retain her urine; as fast as it is secreted, it dribbles away by the fistulous aperture; her clothes are continually moistened by the fluid, and the constant odour that is exhaled, renders her a burden to herself and her friends. The apertures of communication vary in different individuals, according to the extent of the injury; sloughing may have occurred to such an extent, that the rectum, vagina, and bladder form one vast cloaca, into which all the secretions are poured; in such cases but little can be done to relieve the distress of the patient; some apparatus may be fixed to the pudendum, to collect the secretions, and this is all the relief that can be afforded. In less severe cases, where but a tolerably small opening exists, immediately after the detachment of the sloughs, perhaps only sufficient to admit the point of the finger, the best practice is to wait for five or six months, and allow the natural contraction of the opening to go on to as great an extent as it will. After this time some benefit may be produced by introducing a speculum into the vagina, exposing the opening, and touching it with a heated wire; the eschar should be allowed to become detached, and the parts to contract as much

as possible before the same application is repeated. At least a month should elapse between the applications of the wire. By this means a small opening may occasionally be made to heal up. But when the communication is to a large extent, but little hope remains to the patient. Attempts have been made by paring the edges of the opening, and introducing sutures to induce the aperture to close, but little benefit has followed this operation.

Retention of urine is a much less frequent and serious affection in females than in the other sex. It may arise from tumours of the vagina, or uterus pressing on the neck of the bladder, and obstructing the flow of urine. Some women occasionally take it into their heads that they cannot empty the bladder, and will retain their urine for a great length of time. If the bladder be frequently emptied in such cases with the catheter, the retention will continue. The best treatment is to allow such patients to suffer the torment of an accumulation of urine in the bladder, and if left for some time to themselves, they will get rid of their burden without much difficulty. The bladder may lose the power of expelling urine, in consequence of females, through delicacy or indolence, not paying attention to the natural call to evacuate its contents. The bladder may be paralyzed from the same causes as in the male, and the same treatment should be required. There is no great difficulty in introducing the catheter, in ordinary cases, in the female. The instrument should be short, and somewhat curved towards the beak. The fore-finger should be placed in the upper part of the orifice of the vagina, and the point of the instrument, when placed a little above, readily slips into the urethra; it should then be carried onwards in an horizontal direction until the urine flows. Puncture of the bladder can seldom or ever be necessary, in cases of great difficulty in emptying the bladder, where from the pressure of the child's head in parturition, or from the gradual growth of a tumour, the urethra may be very much elongated, and its direction changed from the natural situation. In such cases, great assistance will be derived from the use of long elastic male catheters; should this fail, the bladder must be punctured from

the vagina or above the pubes. In the former case, there is a risk of a fistulous opening being left; but this, when small, can sometimes be remedied.

The shortness of the urethra, its dilatibility, and the ease with which solid bodies can pass from the bladder in the female, are causes which render calculus vesicæ an exceedingly rare disease in women. The symptoms are the same as in the male. Sounding is easy; it is performed with an instrument slightly bent at the farther extremity, and considerably shorter than those employed in the male. The best mode of extracting foreign bodies from the bladder is to widen the urethra gradually by means of the screw dilator, then by the introduction of a straight blunt-pointed knife to notch the neck of the bladder slightly towards each ramus of the pubes; the dilatation is continued, and in a few minutes the finger can be admitted; the stone can then be readily grasped by a pair of forceps, and it is astonishing how large a body may be removed by these means.

Incontinence of urine may follow the operation from the distension of the sphincter of the bladder, but in a few days this will generally cease. The mode of proceeding above recommended is by much to be preferred over the mere dilatation, as being less painful and more rapid in execution; and looking to the after consequences, it is undoubtedly preferable to extensive incision of the neck of the bladder, with or without wound of the vagina.

CHAPTER XIII.

INJURIES AND DISEASES OF SEROUS CAVITIES.

Injury of shut sacs must necessarily be accompanied, in many instances, by corresponding lesion of the parietes and of the contained organs. Fracture of the ribs, with wound of the layers of the pleuræ, and of the lung, with consequent emphysema, has been considered in Chapter III. The wound of the pleura is necessarily accompanied by effusion of more or less blood and serum into the cavity. This is, in the majority of cases, absorbed; but, occasionally, secretion of purulent matter takes place, in consequence of inflammatory action, or from putrefaction of the effused fluid, caused by the admission of air. Empyema is also sometimes the result of idiopathic pleuritis, or of disease commencing in either the bronchial tubes or substance of the lung. The symptoms are generally of an acute nature; the high fever, difficult breathing, and violent pain, in part abate on the accession of suppuration, but the patient is ill at ease; he is flushed at times, his frame is undermined and shaken by violent rigors, his circulation is hurried, and his breathing embarrassed. The diagnosis will be confirmed by the enlargement of the side of the chest, the œdematous condition of its coverings, the separation of the ribs, the dulness on percussion, the want of respiratory murmur, the ægophony,—when the cavity is not full, and some air still received by the lungs—the succussion felt by the patient, and even discoverable to the surgeon on placing his hand or ear to the chest when any sudden motion is

made. The contents are often partly serous, and partly purulent; the serosity, when the patient is still, occupying the upper part of the cavity. The abscess may, however, be of a chronic kind, of many months' duration; sometimes it has existed for a year or two, with immense expansion of the chest, and complete collapse and condensation of the lung. When the collection is large, the heart is displaced, and thrust against the ribs of the opposite side; the unaffected cavity of the pleura and lung is also thus encroached upon, and their functions interfered with.

The evacuation of purulent fluid from the cavity of the pleura must be had recourse to, as soon as its existence is ascertained. The physician will, therefore, be much to blame if he neglect to call in the aid of the surgeon,—as I have known to be the case, even in the clinical wards of a public hospital,—until the matter is about to make its way to the surface, by absorption of the intercostal muscles—when the skin has actually become discoloured, and is beginning to be thinned. Pointing and fluctuation must not be waited for here, as well as in many other situations; the symptoms and signs, formerly detailed, will warrant an opening being made, without previous recourse to exploratory puncture. In such a case, however, as empyema, no harm can arise from making a minute perforation with a grooved needle, previously to dividing the parietes of the cavity more extensively for evacuation of its contents; but this exploratory proceeding is by no means so new as is supposed, nor is any modern practitioner entitled to the credit of the invention. Many surgeons were long ago in the habit of introducing the old-fashioned and coarse cataract needles into swellings of a doubtful nature; it is a practice which, in my opinion, is now resorted to very unnecessarily in a great number of cases; and it is sometimes productive of much harm, as formerly remarked, when applied to solid growths.

The operation of paracentesis thoracis having been determined on, the patient should be placed so that he can be turned on his face readily, should any embarrassment in breathing occur; an incision, about an inch and a half long, is made over the space betwixt the fifth and sixth rib, mid-way between their sternal and spinal attachments; the upper edge of the sixth rib

is felt for, and the point of the bistoury cautiously entered through the intercostal muscles and pleura; the point of the instrument will then be felt to move freely and without resistance, and, on withdrawing it, a very little matter will appear. The nature of the accumulation having been thus clearly made out, and the diagnosis confirmed, the incision may be enlarged to a slight extent, so as to permit the free escape of the fluid; this takes place in jets during expiration, whilst air enters when the chest is expanded. It is no bad plan to place in the wound a short silver or pewter canula fitted with a plug, to fill up and close it completely after the escape of a certain quantity of matter, not so much, however, as to cause a vacuum: the plug should be inserted after an expiration: the matter is allowed to escape from day to day, so as to favour expansion of the lung, and diminution of the cavity of the chest; and in some cases this latter process takes place to considerable extent, the lung being in whole or part obliterated and hepatized. Many patients suffer from irritative fever; and this is to be provided against by every possible means,—more particularly by free evacuation of the contents of the cyst, at the same time that the accumulation of air and the putrefactive process are prevented. The operative procedure is not attended with risk, but even when the cavity is greatly expanded and the diaphragm depressed, the perforation must not be made by the random thrust of a bistoury or trocar.

Injuries to the abdominal parietes, of the serous envelope and of its contents, take place from direct violence, or from concussion and general bruise; the muscular or tendinous fibres are thus torn or separated, the solid or hollow viscera are displaced or lacerated, and blood or their contents are effused into the peritoneal sac; this is attended with collapse, which is often not recovered from; or it is followed after a time by inflammatory symptoms, with remarkable depression of the vital powers; a fatal determination very often supervenes, at no distant period from the infliction of the injury. The cavity is sometimes opened by sharp weapons; in such cases the contents may escape injury, or they may become displaced and compressed so that their functions are interrupted. When the wound is small, the

entanglement of a portion of the floating viscera may be suspected from the symptoms, more particularly the inverted peristaltic motion, with pain and obstruction of the bowels. A boy was stabbed in the abdominal parietes, near the umbilicus, with a knife, the point of which had not passed beyond the muscular walls; symptoms of strangulation of the bowel occurred, and death ensued; a very small knuckle of intestine was found entangled in a transverse opening of the internal oblique, close to the linea semi-lunaris. A somewhat similar case is recorded in a late number of the "*Lancet.*" In such a case the rule is to cut down upon the wounded part, and reduce the protrusion by enlarging the internal opening if necessary. A case was presented at the hospital lately, in which the patient, a boy of fifteen years, received a small punctured wound near the umbilicus with a penknife. He was closely watched, and very actively treated, on the first accession of peritonitis—this gained ground notwithstanding, and terminated fatally—no viscus, not even the omentum, was wounded—this shows the danger to be apprehended from even a very slight opening made into this serous cyst. Some part either of the intestines or of the solid viscera may be involved in the wound; and if so, general means only can be employed, in order to arrest inflammatory action, and put the parts at rest as much as possible; at the same time, irritability is allayed by opiates and other medicines. Any active interference of art, as by enlarging the wound and pulling out or stitching the bowels, is calculated to increase the danger, already sufficiently great, when the wound is extensive; trust must be chiefly placed in the efforts of nature.

Accumulations of serum take place in the peritoneal sac from disordered circulation, from disease of the solid viscera, or from a cachectic state of the system, brought on by a variety of causes, as profuse discharges, abuse of mercury, or of bloodletting. Encysted collections are also met with, generally connected with disease of the appendages of the uterus; these slowly attain an inconvenient size. Ascites, the collection in the general peritoneal cavity, is also a gradual process; the tumour is firm and equal on the surface, and smooth and shining, in its advanced stages, from stretching of the integuments.—

Distinct fluctuation can be perceived, on striking gently with the points of the fingers different and opposite parts of the swelling. No sound is emitted; and there is not the same elastic feeling as that communicated by tapping gently on a tumour caused by the accumulation of air (tympanitis) in the bowels, or in the serous cyst. The encysted dropsy, in general, is at first confined to the hypogastric and iliac regions of one side. It rises into the abdomen, and sometimes attains a most enormous size, perhaps after many years. I have met with cases in which the disease had been in progress nearly twenty years. The tumours were formed of various cysts, and had at last totally incapacitated the patients for the least exertion. It becomes necessary to draw off the fluid by surgical operation, when medicines which promote the secretions, more especially from the kidneys, have failed to give relief, and when the distension is very great, causing interruption to the functions of the viscera, particularly of the chest, and to great anasarcous swelling of the lower extremities. But this proceeding is to be avoided as long as possible, more especially in the ovarian dropsies, for it is only palliative; the secretion is poured out afterwards much more rapidly than before, the necessity for repeating it becoming more and more frequent and urgent. Many patients go on for years, having temporary relief thus afforded from time to time, but the periods between the tappings becoming shorter and shorter. The preferable point at which to establish an aperture in ascites, is below the umbilicus in the linea alba. The bladder is in the first place emptied, though this is of no great moment, seeing that there is no likelihood, in such a case, of its rising near to the place of incision. The abdomen is then surrounded by a broad band of flannel with the ends split; the middle portion of the bandage is made to fit better to the convexity above and below, by triangular pieces being cut out and the edges joined; and having been placed over the fore part of the abdomen, the ends are crossed behind and entrusted to assistants. This is done to give uniform support during evacuation of the fluid, to prevent faintness from the accumulation which would otherwise take place in the branches of the portal veins, and to prevent also the giving way of any vessels, and the effu-

sion of their contents into the peritoneal cavity. The umbilicus is felt for, and an opening cut in the bandage a little below it. A small incision is made through the integument with the point of a bistoury; and this should be made to penetrate also the serous membrane. A minute stream of fluid follows, and the trocar is then introduced. I have lately used a trocar with the edges and point rounded off; and in making the perforation in doubtful cases of encysted dropsy, this cautious mode of proceeding is always the most advisable. In ovarian tumour, the cyst is often condensed; the fluid is thick, glairy, and albuminous, and the fluctuation not very distinct. The incision should be made on the most prominent part, as at that point there is a chance of adhesion existing betwixt the serous surfaces, as well as less risk of the interposition of any important parts. The position of the vessels must be avoided, but it must be recollected that the abdominal parietes yield very unequally; and though it is sometimes desirable, even in the common dropsy of the belly, to tap in the linea semi-lunaris, it is no easy matter to find it. The course of the epigastric artery is known and can be avoided; the branches of the circumflexa ilei, which ramify on the lateral parts, will not prove troublesome. In fact, bleeding, when it does take place, is into the cavity, from venous branches deprived of their accustomed support. Correct diagnosis in abdominal swellings is not always very simple, or easily attainable. But surely no practitioner of the present day would think of making an extensive incision through the abdominal parietes, in the hope of finding a tumour attached by a pedicle, and with the view of extirpating it; such things have been done, but with very deplorable results. Tumours have been supposed to exist in the abdomen when they did not; and as to their nature and attachments, there are no means afforded of predicating with certainty. All this, and much more, the various attempts at extirpation have shown but too satisfactorily. After tapping, the abdomen is to be supported at first by the band; but after a short time, in addition to this, or instead of it, a broad flannel roller is to be employed, applied smoothly and with a moderate degree of pressure.

CHAPTER XIV.

HERNIA.

It is highly desirable that every practitioner of medicine should fully comprehend the nature of abdominal hernia, should be well aware of its diagnostic signs, and be competent to afford relief before the symptoms have become of so urgent a nature as to indicate great and impending danger to life. Cases of hernia are most likely to be treated safely for the patient, and with judgment and skill, by the practitioner who is fully prepared to proceed to the last remedy when circumstances demanding it arise. It has been very truly said, that skill in operating is of the utmost importance in giving the surgeon perfect self-possession; a bad operator will hesitate in the most simple cases, whilst a good and dexterous surgeon, like a man skilful in the use of weapons, will not enter rashly into difficulties, but being engaged from conviction, will bring himself through with courage. Every young man, then, should endeavour to acquire some degree of dexterity in operating, for that will go far to make him a judicious surgeon.

Descriptions of the parts concerned in hernia, both oral and written, are too often encumbered by a number of technical terms,—many of them meaning the same thing, or applied to parts of the same tissue,—in such a way as to create confusion, and render those structures, and changes produced upon them, exceedingly complicated; while, in reality, they are extremely simple and easily to be understood. The protrusions of the

floating viscera take place most frequently from the lower part of the cavity, through the natural openings, which become more or less dilated; and they carry before them a pouch of peritoneum, which contracts new attachments, by cellular tissue, to the natural layers which line and cover the openings. In the male, the most common form of hernia is that which descends along the spermatic cord. It appears first as a fulness in the region of the inguinal canal, and is apparent only in the erect posture, increasing upon muscular action. When the patient is desired to cough, an impulse is given to the fingers placed on the soft and elastic swelling; and this swelling generally recedes upon the application of gentle pressure. By a continuance of the causes which have induced displacement of a portion of the lining membrane of the abdomen,—and which does not again recede, but remains ready to receive any of the contained viscera that may be impelled towards it,—the sac is elongated; it bulges out below, like a flask, whilst the neck remains narrow, and somewhat constricted by the resistance of the tendinous or membranous aperture through which it has escaped.

Descent of a portion of the abdominal contents may take place suddenly from violent muscular exertion, as in leaping, or raising a heavy weight. But it is more frequently a gradual process. The parts may have been originally imperfect, the rings wide, and the surrounding parietes weak, and the interlacement of fibres connecting the parallel fibres not so well developed as usual; but the best formed parts must yield at last to a constant impulse upon them from within, as by that caused in coughing incessantly, or in straining very frequently to empty the bladder. A very great many of those who have laboured long under urinary disease are also ruptured, and not unfrequently on both sides. In many instances, however, hernia arises very imperceptibly, without the patient being aware of the exciting cause; and it has sometimes made considerable progress in its descent before attention is directed towards it. The affection is met with most frequently, as might be expected, in those who follow particular trades or occupations. A great many seafaring men, and a great many of those engaged in the keeping of horses, labour under hernia.

INGUINAL HERNIA.

The most simple form of inguinal hernia is that, in which the bowels come down along the natural passage into the scrotum. The descent of the testicle, and the period at which it occurs, are familiar to all; the mode in which it is invested by peritoneum on its fore-part, and covered by a loose reflected fold, is likewise well understood; as also the manner in which the neck of this protrusion is closed, in almost every instance, long before birth. But there are exceptions; the closure does not take place, or is imperfect, and the bowels descend, so that their peritoneal surface lies in contact with the serous covering of the testicle.

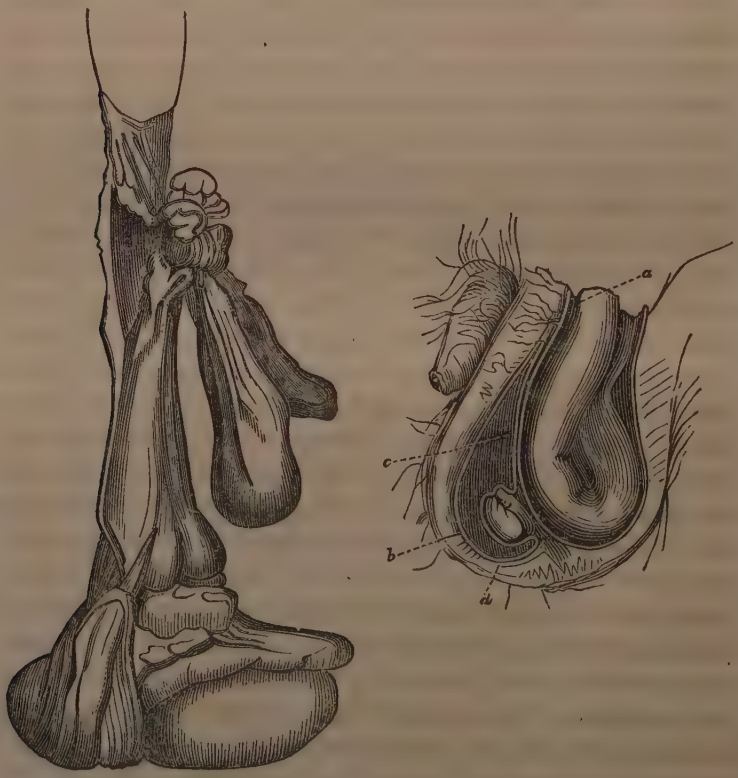
The hernia named congenital is thus produced; the tunica vaginalis testis forms the hernial sac; and the natural coverings of the cord, thickened more or less by pressure, of course invest its neck and body. The abdominal rings and canals are widened and the epigastric artery is pushed a little to the mesial side and towards the spine. When the protrusion is permitted to continue, the natural obliquity of the canal does not take place during the developement of the parietes, and the opening between the abdominal cavity and the tunica vaginalis is short and direct.

In other cases, the neck of the tunica vaginalis is only partly closed at one point, and not throughout its whole extent. The tendinous openings are imperfectly formed, and a protrusion takes place before or soon after birth; the bowel does not, in this case, descend into the original process of peritoneum and come in contact with the testis, but a fresh protrusion precedes the bowel; the parts forming the cord are separated, and the neck of the tunica vaginalis lies on the anterior and inferior aspect of the new sac attached to it by cellular tissue, which becomes condensed, and intimately connects the outer surfaces of the two portions of peritoneum. This variety of hernia has been met with, a few times in a state of strangulation in the adult, and has proved very puzzling and inexplicable to the surgeons engaged. The first case of the kind which I happened to see was in the Royal Infirmary of Edinburgh, under the care of the late Mr. George Bell, in 1814, at which time I filled the office of house-surgeon in that institution. The patient was admitted

with the usual symptoms of strangulation, which had existed for some days; and he had been brought in a cart more than twenty miles to the hospital, suffering extreme agony. There was no delay in proceeding to the operation; the layers were divided down to what was supposed to be the hernial sac; this was opened, and after the escape of three or four ounces of serum from a cavity shut at the top, a tumour presented, covered by serous membrane, and resembling a swelled testicle, with an appendage, which really was the testis, at the lower part. The surgeon was a very cool and collected operator, and his colleagues were experienced practitioners; but they did not know what to make of the appearances, and retired to consult upon the further steps of the proceeding. On their return, the swelling was cautiously cut upon; one layer was divided, and then a second, opening into another sac, and from this a quantity of serum also escaped; on enlarging the opening, a mass of omentum was exposed: the stricture was then relieved, and a portion of the omentum removed; but, in spite of free leeching, the symptoms of peritoneal inflammation were not subdued, the bowels did not act, and the patient died within three days; no examination could possibly be obtained. A case very similar in all respects, excepting as regards the result, occurred to me, about two years ago, in the North London Hospital, and is recorded in the "Lancet," vide vol. i, 1834-35, p. 883. The operation was not interrupted in consequence of the unusual appearance, although, without previous experience in the matter, there might have occurred a little delay in completing the proceeding. The patient made a good recovery, so that the intimate relation of parts, in these two cases, can only be gathered from what was observed in dividing the tissues to the extent requisite to attain the object in view, viz. the relieving of the stricture, and the return of the extruded parts.

Sir Astley Cooper, in his splendid work on hernia, has related the dissection of a patient, communicated by Mr. Foster, in which the tunica vaginalis, distended with fluid, lay in front of a hernial sac, and extended nearly to the abdominal ring; upon cutting through the posterior layer of this tunic, a sac was exposed and opened, containing a portion of intestine.

Mr. Hey, primus, of Leeds, has given a very accurate account of the dissection of a child, fifteen months old, in whom protrusion existed with relations similar to those already described; and he named it hernia infantilis, under the supposition probably that it occurs soon after birth, and to distinguish it from the ordinary congenital species. The diagram given by Mr. Hey's son conveys a very imperfect idea of what appears to be the relative situation of the different parts. Through the kindness of Mr. Wakley, I am enabled here to give copies of the wood-cuts which illustrated a clinical lecture on the subject formerly referred to. The first is a copy, somewhat magnified, of Mr. Hey's diagram; the other represents probably the true position and relation of parts. It is copied from a diagram made in my note-book in 1814, at the time the first case occurred.



The late Mr. Todd, of Dublin, has also left some very excellent observations on hernia combined with hydrocele. (Dublin Hospital Reports, vol. i. p. 227.) He seems to think that the descent behind the upper part of the tunica vaginalis may take place at any period of life, and that the bottom of the hernial sac may form adhesions to the upper part of the tunic. When the vaginal cavity becomes distended with fluid, it will rise up and cover the fore part of the hernia; and he thinks that hydrocele is more likely to accompany this kind of hernia than any other, in consequence of the greater pressure upon the vessels of the cord. Hernia and hydrocele certainly often co-exist; but the one tumour is generally situated above the other, and free from it, so that an opening can be made into either without any interference with its companion.

The common oblique inguinal hernia, so named from its passage along the canal, is protruded in the cellular tissue enveloping the cord, and under its proper layers; the body of the tumour lies above, and rather in front of, the testis and its serous envelope. The vas deferens is often separated considerably from the other parts accompanying the cord; so that, by the long-continued pressure in old herniæ, these vessels lie on either side, and even nearer the anterior than the posterior aspect of the neck and body of the sac. The epigastric artery and accompanying veins lie on the posterior and inner side of the neck, which is at first of some length, and forms a swelling which extends obliquely from the outer side of the tuberosity of the pubes towards the anterior superior spinous process of the ilium, and of course above the ligament of Poupart. The tumour is often indented as if by a tight band, and sometimes more than one such indentation is observed. This arises from the descent of those portions of peritoneum with their investing condensed filamentous tissue, which at one time had formed the neck of the sac. In herniæ of long standing and large size which have not been reduced, the neck is shortened; and the apertures are much enlarged and brought opposite each other, so that the obliquity of the inguinal canal in a great measure disappears. The proper layers covering the sac, together with the cellular tissue, are condensed and rendered much more distinct, especially the

cremasteric fascia, with which is generally incorporated the proper fascia, described by Camper as coming off from the external abdominal ring. Under the integument is found a distinct and strong layer, enveloping the neck of the tumour and passing over its body; this is furnished from the superficial abdominal fascia. Under this, after dividing some cellular tissue, appears the external ring with its superior pillar, and the interlacement of fibres connecting it to the ligament of Poupart, forming the lower border of the opening, or the inferior pillar. The tendinous fibres passing over the neck of the tumour can then be readily traced, forming a sort of sheath for the neck of the sac, rather than an aperture with defined edges. In connexion with this tendinous layer is another which has accompanied the tumour from within the tendon of the external oblique; the fibres of this cremasteric fascia, fleshy and tendinous, can be traced all over the swelling; and in old and large ones, its thickness and strength are remarkable. Under this again, and immediately investing the sac, is the extension of the funnel-like prolongation of the fascia transversalis, also rendered very distinct and firm. The hernia, besides the peritoneal sac, is thus provided with a layer of fascia from within the abdominal parietes, with one from without, and with an intermediate one furnished from the muscles and tendons through which it passes. In many cases, the condensed cellular tissue may be, and is, often split up into various other layers, even during operations on the living body, but to no good purpose.

Another form of inguinal hernia is that known as the direct; and it is very properly so named, in consequence of its bursting through the tendinous expansion of the internal oblique and transversalis muscles, immediately behind the opening in the external oblique. The neck of the tumour is, from the first, short, and the epigastric artery lies on the outer side; in fact, it is not at all displaced, but occupies its usual situation behind the abdominal layers, and betwixt the two openings in them for the passage of the spermatic cord. This hernial tumour is unconnected with the cord, and is furnished only with one distinct layer, that from the superficial abdominal fascia; under this, some condensed cellular tissue invests the

sac, along with fibres from the margin of the opening in the tendon of the external oblique; it can be recognized, in general, by its form, and by the absence of any trace of neck extending towards the anterior spine of the ilium, the more especially if examined when reducible; the fingers can be passed at once into the abdominal cavity, rather towards the mesial plane, carrying the integument before them.

The contents of the hernial protrusions at the lower part of the abdomen generally consist of a portion of the floating intestine, small or large, or of omentum, or of both together. Sometimes the fixed portions of the colon slip down, their posterior cellular attachments behind being carried into the inguinal canal; a peritoneal sac invests the anterior aspect only. And, occasionally, even portions of the bladder pass out at the apertures in the parietes; these are rare cases, however. It does not appear to have been observed, whether the protruded portion of the bladder consisted of all the coats, or whether it was only a portion of mucous membrane, extruded from betwixt the meshes of the detrusor urinæ into the hernial sac; this latter is most probably the case. The protruded intestine, or omentum, is easily replaced, at first, by pressure in the recumbent position. It again descends when the patient is erect, and uses any muscular exertion. The tumour is distended when he is made to cough, and the increased fulness is appreciated by placing the fingers upon the part; pressure upon the opening of the tendons will prevent descent. When the sac is full, the cord cannot be distinguished. Such are the signs of this disease; in addition, the history will show that the swelling has come from above. The permanent protrusion of a small portion of bowel may not cause much uneasiness in any way, if the openings are tolerably large; but when much of the intestine is thus deprived of the due support from the abdominal muscles, distension takes place, from accumulation of flatus and fæcal matters, and the whole digestive apparatus is put more or less out of order in consequence. A careful observance of the signs, and attention to the history, will enable the surgeon, under all circumstances, to decide upon the nature of the swelling, and to distinguish betwixt hernia and other scrotal tumours. The form, consistence, transluceney,

freedom of the cord, progress from below instead of above, and constant presence, will mark the hydrocele. The accumulation of serum in the vaginal covering of the cord prevents that body from being felt, and there may be some impulse communicated by coughing, when the tumour extends into the inguinal canal; but the fluctuation, the form of the swelling, and the history, will generally enable the surgeon to come to the proper decision. Sometimes hernia and hydrocele of the cord co-exist; and the symptoms of strangulation, in doubtful cases, have also decided the question as to the course to be pursued.

Some years ago, I met in consultation two very judicious practitioners, Dr. John Thompson and the late Mr. Law, regarding a case of obstructed bowels in the person of an old gentleman. Dr. T. had seen the patient previously, and had given him advice as to a swelling in the course of the cord, which he had, after attentive examination, discovered to be hydrocele. The swelling had become somewhat painful, but scarcely any alteration had taken place in its form or size; the symptoms, however, having persisted in a violent form for more than two days, a farther examination into the nature of the tumour was warranted. Accordingly, an incision was made, very carefully upon it. The hydrocele of the cord was exposed; but alongside of it lay a very small hernial sac, containing a knuckle of intestine in rather a bad state.

Solid enlargement of the testis, of any kind, is marked by its form, consistence, and progress. The appearance and history of hæmatocele, of anasarcous hydrocele, and of the inflammatory œdema of the scrotum, can never be confounded with those of protrusion from the abdomen. Enlargement of the spermatic veins, cirsocele, is increased in the erect position, and upon exertion; and when large, the swelling so caused receives an impulse from the action of the abdominal muscles. It also disappears in the recumbent position, and on pressure. But the form of the tumour, and its feel, are as different from those of hernia as can well be conceived; the testicle hangs low, with an irregular soft swelling above it, composed of a congeries of vessels which can be distinctly perceived, both by sight and touch. The vas deferens can be easily felt. The swelling disappears

on placing the patient recumbent and raising the scrotum; and it returns quickly from below, upon gentle pressure being made upon the ring, in whatever position the patient is placed. Whereas, a hernia, it is well known, cannot descend, if the finger cover accurately the external opening of the inguinal canal.

The protrusion of the abdominal contents must not be permitted to continue. By returning them into their proper cavity, and retaining them with great care, there is a considerable chance, in many cases, of the openings contracting, and of the canal undergoing such alteration as will prevent further descent. This is more especially the case in young subjects, before the muscles have been fully developed, and the canal acquired its due obliquity. But, at all ages, it is desirable, even with the view of affording this chance, to prevent, with scrupulous attention, even the smallest descent of recent hernia. I have met with repeated instances in which a person, well fitted with a truss, has been enabled, after a few months, to discontinue its use. It is highly necessary, besides, to keep up hernial protrusions, on account of the danger to which the patient is otherwise subjected from accumulation of the contents in the extruded portions of the bowel. This is frequently followed by engorgement of vessels and swelling of the viscera contained in the sac, in consequence of obstruction to the return of blood. The tendinous apertures dilate very much, it is true, so that, in many cases, nearly the whole hand can be passed through them; but this is a very gradual process. If, in any way, whether from accumulation of flatus and fæcal matters in the bowel usually contained in the neck of the sac, from accumulation in and distension of the venous vessels, or from further protrusion, a disproportion is created betwixt the contained and containing parts, and impactment occurs, the patient is immediately subjected to a most distressing and alarming train of symptoms, and his life is placed in the greatest possible peril.

Several causes may render hernia irreducible. From its natural connexions, as already explained, it may be impossible by any means to return parts of the large intestine. Adhesions, more or less firm and extensive, may form betwixt the serous covering of the protruded part and the interior of the hernial

sac. To this the obstruction of the bowels has been attributed by Mr. Stephens, in a very ingenious book on the subject; and he has proposed to make incisions solely with the view of separating these adventitious connexions, so as to permit the bowel to re-assume its natural peristaltic action. But it is not possible to predicate the existence, situation, or extent of adhesions; and upon the chance of discovering them, it will not often be prudent to resort to incision of the peritoneal cavity; the opening and exposure of which, whether from the entrance of air at a lower temperature than that of the body, or from the shock, is attended with greater danger than Mr. S. and many others suppose. Strong grounds must exist, as regards the threatening nature of the symptoms, before an operation is resorted to. Should adhesions be discovered to exist in the hernial sac, I believe that they may more frequently be interfered with advantageously, to permit replacement of the bowel, than is generally supposed and practised. A loaded state of the intestinal tube may cause a temporary obstacle to the reduction of hernia. The descent of a greater quantity than usual, accumulation of fat in the mesentery or epiploic appendages, or a swollen and altered state of the omentum, may also prevent reduction, either in whole or in part, and either temporarily or permanently. Also, the long-continued residence in a hernial sac of a large mass of the abdominal contents, with corresponding contraction of the cavity, may render it impossible to put them back; indeed the attempt should not be made.

Some of the causes enumerated may be removed, others cannot; when only part of the viscera which have descended can be replaced, and no urgent symptoms are present, the tumour should be supported by a bag-truss, or by a truss with a light spring and hollow pad, made according to the size and situation of the swelling. Farther increase is thus prevented, and the displaced viscera perform their functions better in consequence of the gentle pressure. When the rupture can be entirely reduced,—and let it be recollected that the sac does not return in any case,—means must be taken to prevent a relapse. This is only necessary when the patient is erect and in exercise. A properly fitted truss, made to press either on one end of the

inguinal canal, or along its whole course, as the case may require, is applied before the patient gets out of bed, and removed when he returns to it. Great attention is demanded on the part of the machinist in proportioning the degree of pressure, and more especially in fitting the head of the truss to the particular case. A concave pad will be often found to suit well; and it is occasionally necessary to fashion the compress, so that the testis, which has not fully descended, may not be injured. Very frequently, a thigh-strap suitably padded cannot be dispensed with; but, in ordinary cases, the truss may be made so as to fit very well, and answer the desired purpose, without this troublesome appendage. Every variety of truss is to be obtained. The springs are differently arranged; and some are double, so as to increase or diminish the pressure when shifted. In some, the head of the instrument is attached by a ball-and-socket joint; in others, made to shift with a slide and screw. The compresses are of all forms and consistence. They are generally stuffed with wool, and covered with chamois leather; or they are formed of wood, of ivory, or of India rubber. The simple truss well constructed, made for and fitted to the particular individual, with or without a thigh-strap, is in general to be preferred.

As has been remarked above, the protruded parts may become swollen from several causes; a greater mass than usual may have descended, and thus the contained parts may have become disproportioned to the capacity of the sac, to the size of the passage through the tendinous parietes in which its neck is lodged, and to the neck of the sac itself, or rather the very condensed cellular tissue immediately investing it. The membranous expansion and tendinous apertures are all very unyielding; they become dilated gradually, but do not yield to any sudden impulse. The circulation of the bowel is impeded, and its functions interfered with; and the interruption increases rapidly, both as regards the return of blood and the proper course of the fæcal matters. The patient becomes sick, the peristaltic motion is inverted, and the contents of the stomach and of the bowels above the protruded part are ejected; abundant fetid secretions, from the surface of the bowels, and from the liver, are also vomited, with great suffering and distress to the patient. The

powers of life are much lowered. Heat and pain, often intense, and increased on pressure, take place in the abdomen; the circulation is hurried, the pulse sharp and wiry, the countenance anxious, and the bowels obstructed; but evacuation of the contents of the lower bowels may occur after the accession of the symptoms of strangulation.

If relief be not afforded, the confined bowel undergoes alterations which unfit it for again performing its functions. It is notched deeply where compressed by the strictured parts. It becomes of a dark chocolate colour, and loses its contractility. The dark colour becomes deeper, infiltration takes place in the sub-mucous tissues; and sometimes purulent fluid is secreted, attended with thinning of the membranes. In other cases the coats become more and more thickened, the colour grows still darker, and the serous surface appears tender and broken in patches. At the same time that this occurs, and when the contents of the bowel are in consequence about to escape into the sac, lymph is generally thrown out in abundance about the neck of the tumour, so as to close the communication with the general serous cavity. The bowel within is often inflamed, and, where notched by the stricture, is liable to ulceration. When it gives way at this point, effusion of the contents into the peritoneal cavity is followed by sudden aggravation of the symptoms, and a fatal termination very speedily ensues. In the advanced stage of strangulated hernia the circulation flags, the surface is cold and clammy, the countenance becomes sallow and contracted, the features are pinched, the breathing is laborious and quick, the nostrils are in constant motion, the abdomen is distended, tympanitic and tender; the patient is distressed by constant vomiting and hiccough, and death soon closes the scene. The progress of the symptoms, as regards rapidity and intensity, is somewhat influenced by the bulk of the swelling, the size of the neck of the sac, and of the opening which embraces it; and very much, also, by the quantity and nature of the protruded parts. The danger of rapid and prejudicial alteration, upon the viscera involved, also depends upon these circumstances. In some cases of small hernia, in which the neck is narrow, the symptoms are of a most acute kind, and the patient may be lost within a very few hours.

Whereas, in other cases, the accession of the symptoms is slow; they are not of an alarming character for a time, the bowels act, the vomiting is relieved, there is no pain or swelling of the abdomen, and no anxiety of countenance; exacerbations occur occasionally, but many days pass over before alarm is taken. But the symptoms may be urgent, and the case altogether rapid in its unfavorable course, whatever may be the size of the tumour or openings; for, urgency is more dependent upon the bulk and condition of the contents, as already insisted upon, than upon the state of the canal. The presence of omentum in the hernial sac along with the bowel often protects it considerably, rendering the symptoms less acute and the danger less imminent. It is to be kept in view that obstruction of the bowels and peritonitis may very readily arise in a person who is subject to hernia, independently of strangulation of the tumour; and it must also be borne in mind, that under many circumstances, the return of the portion of bowel which has descended, in whatever way that may have been accomplished, may be followed by an aggravation of the symptoms and an increase of risk.

Hernia is a disease in which the utmost care must be observed, both in ascertaining the history and attendant circumstances, and in adopting means for relief. The diagnosis of the disease has already been considered. We first of all ascertain that there is actually a descent from the abdomen. Inquiries should then be made as to the period at which the rupture first appeared; whether or not it has been always reducible, and whether reducible in whole or in part; when the entire reduction was last accomplished; when part became irreducible; whether or not means have been employed to retain the parts, and if so, whether the truss answered the purpose well or not. The cause of the recent descent, and the period at which it occurred, must be also ascertained; a very frequent cause is tenesmus, caused by the action of medicine, or attendant on bowel-complaint.

If the patient be seen very soon after the rupture has come down, before any great increase in its volume or any alteration of tissue can have taken place, little difficulty will in general be experienced in giving relief. But the tumour may from the first be very tense, the sac and its neck being as it were crammed

full; and the surgeon may be disappointed in effecting the reduction so readily as he may have expected; in such cases, the symptoms of strangulation appear simultaneously with the descent of the tumour, even although he be called within an hour or two after strangulation. He may even be foiled entirely; although, if he understand his profession thoroughly, this will not often happen. All obstacles to the replacement of the protrusion must be in the first place removed; with this view, the pelvis and shoulders are raised, in order to relax the abdominal muscles; and the patient is kept in conversation so that he cannot expand his chest, so as to enable the muscles, by gaining a fixed point, to act forcibly. In inguinal hernia of any kind, it is not necessary to bend the thigh very much; little effect being produced upon either the coverings or apertures, by any position of the limb. The object is, in the first instance, to diminish, as much as possible, the bulk of the protruded parts, and then to return them into the abdomen. With this view, the tumour, when it fills the scrotum, is grasped with the hands spread out, so that the pressure may be uniform. This is persevered in steadily, the body of the hernia being brought as much as possible in a line with its neck; if very oblique, the tumour is carried towards the opposite thigh; if direct, it is raised, and pressure made towards the cavity of the abdomen. When the motion of fluid and flatus is perceived by the touch, or made apparent by a gurgling noise, there is great encouragement for a continuance of this operation of taxis, as it is called: pressure is, at the same time, made gently with the points of the fingers at the neck of the swelling; and the surgeon, if he conduct the proceeding with a wish and determination, if possible, to succeed, will generally find his attempt, after a time, crowned with success. The patient will have then instant relief from all his unpleasant symptoms; his nausea and pain will cease; the bowels will act naturally, or answer readily to gentle purgative medicine; and in a few hours, all the effects of strangulation will have passed away. The continuance of bad symptoms, or the occurrence of a fatal result after simple reduction, is rare indeed, in comparison with the results of the best planned and most dexterously-conducted operation. But circumstances will

occasionally forbid perseverance in the taxis, or even render it imprudent to have recourse to it at all. The symptoms may have been of long duration, and may have become very intense. And there may be good reason to suppose, that unfavorable changes have occurred in the parts contained within the sac; that they are in such a state that their restoration to the abdomen would be attended with an aggravation of all the symptoms, and would certainly lead to a fatal result. The taxis may have been employed, and the attempt reiterated; the tumour, in consequence, may have become tender; and the surface may have become the seat of inflammation, as well as the deep parts.

In compilations for the use of students, and even in the works of some practical surgeons, a variety of measures are recommended as proper to be employed, in order to relieve the symptoms, or assist in the accomplishment of the taxis. General bleeding and baths are occasionally employed with advantage, according to the condition of the patient—his age, strength, and duration of symptoms, being duly considered; their object is, by causing collapse, to favour relaxation of the muscles which oppose reduction. But the weak state of the patient, or the urgency of the symptoms, will often forbid any such measures being adopted; of the other means recommended, some are useless, others even hurtful—injurious either in themselves, or from the delay occasioned in their employment.

The application of heat locally by fomentations, and of cold, by bladders with ice, or by dashing cold water on the parts; the shaking of the patient with his head dependent; the application of pressure to the part by a column of mercury, or the opposite course of removing pressure by exhausted cupping-glasses over the rings; the exhibition of enemata,—are plans not likely to be followed by any advantage. External applications cannot be expected to have the effect of suddenly relaxing the tendinous openings or membranous investments of the neck of the sac, or of causing a diminution in the bulk of the protruded parts, so long as the obstacle exists to the course of the fæcal matters and to the return of blood. Even could fluid be made to pass readily through the intestinal tube from below the obstruction, the parts are not likely to be thus disentangled. Purgatives, antimonials,

and tobacco-enemata increase the mischief, and at the same time diminish materially the chance of the patient's recovery. Local abstraction of blood by leeching is of no use in this state, though a most beneficial practice in inflammation of the contents of a large hernia without strangulation.

Should the taxis, perseveringly and judiciously employed,—favoured or not, according to circumstances, by bleeding or the warm bath,—fail, there ought to be no delay in proceeding to relieve the patient by surgical operation; there is some slight risk attendant upon this proceeding, but there is still greater danger in delay, so permitting the occurrence of those frightful changes upon the contents of the sac, as well as upon the viscera contained within the abdomen, as already described, with their almost inevitably fatal consequences. Mr. Hey, a most experienced and judicious surgeon, long ago remarked,—that he never had reason to regret having recourse to the operation too soon, but that he frequently had occasion to observe the fearful effects of delay in such cases.

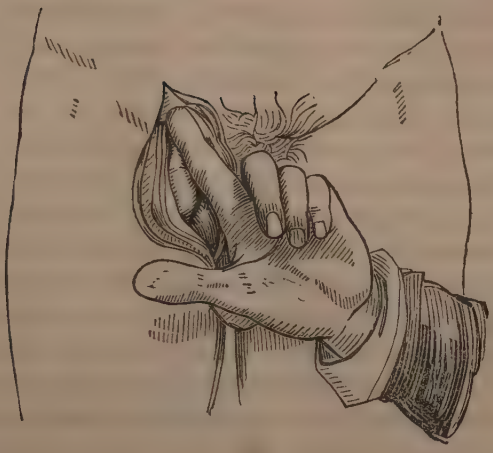
OPERATIONS FOR HERNIA.

The patient should be placed on the edge of his bed, or on a table of convenient height; and the parts, previously shaved, are put upon the stretch, the tumour being grasped behind by the left hand of the operator. An incision is commenced above the inner opening through which the protruded parts pass, and is carried down over the middle of the neck and the body of the swelling. In hernia occupying merely the canal, the incision should extend from above the internal opening to the farther extremity of the swelling; in scrotal ruptures of small size, it should be carried nearly to the bottom; but in larger tumours, and in those more especially which have not been wholly reducible for some time, the opening should be limited almost entirely to their neck. The reason for laying down these rules must be obvious; it is necessary that the seat of stricture should be reached, so that it may be removed without danger or delay; but if the sac is opened, and that to a great extent, and it is afterwards found impossible or improper to attempt the reduction, then the contents would be left exposed and unsupported. The

first cut is made through the common integument and fatty matter, with a scalpel or bistoury held lightly in the unsupported hand, either in the position represented at p. 5, or in the more constrained manner of a writing pen; the superficial abdominal fascia is then also divided, as may be the second layer in succession, the cremasteric fascia with the conjoined fibres from the opening in the tendon of the external oblique; the prolongation of the fascia transversalis, the immediate investment of the peritoneal sac, will thus be exposed. These layers may all be incised, one after the other, with the hand unsupported, by a person in the habit of using the knife constantly, and who can do so with steadiness and precision. Dissecting forceps may be used in lifting them; or they may be scratched through at one point, and a grooved probe introduced into the opening, so as to separate one from the other; the division is then made by pushing the back of the knife along the groove of the director: the three proper layers, and indeed a good many more when the director is used, are divided, and the sac exposed; this is the safe course for a young operator to pursue. The surgeon will now attempt to relieve the stricture, by careful incision upon the neck of the sac; or he will open the cavity with great care, and proceed, according to circumstances, to divide the stricture and dispose of the contents. If he had determined upon the former course, he will endeavour to incise the deep layer,—the funnel-like process of the transverse fascia, which he has opened,—together with the superior pillar of the ring, by insinuating a blunt-pointed narrow bistoury, slightly bent, betwixt this sheath and the neck of the sac, and turning its edge forwards and upwards. He will thus cut the resisting tissues to a sufficient extent, in a line parallel to the linea alba; the reduction of the contents of the sac may then be attempted; and if it prove successful, one great danger of the operation, that arising from the exposure of the peritoneal sac, the lowering of its temperature, and the consequent shock upon the system is avoided. But even in favorable cases, there are difficulties to be encountered in accomplishing this very desirable object; the constriction is caused by a condensed cellular and fibrous tissue immediately investing, and incorporated with, the serous cyst. The stricture may, in fact,

be said to exist in the neck of the sac itself, and this must be cut before the contents can be returned. In many cases, the reduction is impeded by adhesions, and by entanglement with omentum: when the strangulation has existed any considerable time, it is desirable to ascertain the precise condition of the protruded parts, and to consider after careful and actual inspection, whether they should be returned or not.

If the sac is to be opened, this should be effected with due precaution and care. Generally some dark-coloured serum is present along with the viscera, and the sac does not closely invest the contained parts. The membrane should be pinched up between the nails of the fore-finger and thumb, and cut to a slight extent, the blade of the knife being laid along the surface horizontally. The point of a blunt-pointed bistoury, guided by the finger, is then passed into the opening, and the sac, together with the layers, slit open, nearly to the extent of the wound in the integuments. The surgeon must be prepared to meet with and overcome difficulties in his progress. The layers may be condensed; there may be such an arrangement of parts as described and delineated p. 527; the sac, or its immediate investments of cellular and fibrous tissues, may be enormously thickened. I am in possession of the sac of a congenital hernia nearly two lines in thickness, coated internally by a layer of firm, organised lymph. The hernia may be direct, and the layers few in number,—in fact, only one perfect,—so that the sac is reached at once, and by a rash operator might be opened as one of the fasciæ. The sac is intimately connected to the bowel or omentum, in some cases, and great care is required to avoid wounding these parts. Supposing that the sac is opened and its contents exposed, these are unravelled and examined; if comparatively sound and reducible, with nothing in their connexions or condition to forbid it, the structure is forthwith divided. This is done upon the guidance of the fore-finger of the left hand, as shown p. 543; the narrow part is felt, whether seated opposite the external ring, or opposite what has been called the internal one, namely, the commencement of the inguinal canal; in many cases both require to be dilated, and the one tight ring is generally situated immediately within the other. The bistoury is



introduced with the blade flat, and after it has been insinuated under the narrow part, the edge is brought to bear upon it by raising the handle, the fulcrum being on the point of the finger.

In all cases, whether the hernia is oblique,—common, congenital, infantile,—or direct, division of the stricture is made in the same direction,—namely, parallel to the linea alba; this is with the view of avoiding the epigastric artery, which will thus be safe, whether it course inside, as in the oblique, or outside, as in the direct variety. Sir A. Cooper, and latterly Mr. Key, have advised that the neck of the hernial sac should not be cut, but that the bistoury should be pushed outside the serous membrane, still guided by the finger within; this part of the proceeding is thus rendered complicated and uncertain, without any great counterbalancing advantage. If the peritoneum be opened, the incision of half an inch, more or less, can be of no consequence; and, besides, as already remarked, the stricture in the majority of instances cannot be relieved without cutting the neck of the sac, in which it is truly seated. After this has been effected, as ascertained by the finger passing freely into the cavity, the reduction is to be commenced. For this purpose, it is as necessary as during the attempts to reduce by taxis, to remove any obstacle to the return, by position, &c. It will be

found of the utmost consequence, also, to fix the sac firmly; and for this purpose, an assistant should be directed to place his fingers in the bottom of it, whilst the surgeon proceeds to his task. In the first place, the bowel should be emptied of its contents; and perhaps a small additional portion may be with advantage pulled down, so as to expose the parts which have been indented by pressure against the stricture; the whole mass is then gently squeezed with the fingers expanded, and the flatus and fluid contents pushed back into that portion of the canal within the general cavity. This having been effected, the gut is slid back, bit by bit, until the whole is returned; the omentum is then disposed of. It may be unchanged to a great degree, and then is easily pushed back; it may be adherent, firmly and intimately, and there it may remain; or it may be so tuberculated that it cannot, and ought not, to be returned. The proper practice will be to leave it in the state and place that it occupied, probably for years, rather than to cut or tie it off. It is recommended by some writers that the omentum should first of all be returned, but this is not generally possible in actual practice; the bowel has come down last in the majority of cases, and gives rise to all the disturbance, whilst the omentum has probably been resident there, more or less, for a considerable period. The whole of the bowel may not be reducible in consequence either of its natural connexions or of intimate adhesions.

Supposing that the reduction has been effected satisfactorily, it will be proper to adopt means to prevent a fresh escape of any portion of the viscera; neglect of this precaution has led to unpleasant consequences. The wound having been put together by a few points of suture at the upper part, a compress or two of sufficient size are to be placed over it, and secured by the turns of a double-headed roller passed round the pelvis and thigh repeatedly, and crossed neatly over the point where pressure is essential. The wound must be left open below, and the scrotum supported, to prevent breaking up of the cellular tissue by the effusion and accumulation of blood. In this and in all operations for hernia we should be most careful not to close the wound until all hæmorrhage is arrested; the small arteries that may

be divided, should be tied. Where such precautions have been neglected, large quantities of blood are often extravasated between the muscles of the abdomen, and occasionally within the abdominal cavity itself, of course very much augmenting the danger of the patient. This I have known happen to a very alarming and dangerous extent, for it is almost sure to be followed by unhealthy suppuration, with loss perhaps, of the integument and the other tissues. It has happened that the intestine has been wounded in dividing the stricture. A very good case is related by Mr. Lawrence in his admirable "Treatise on Ruptures," in which the opening was pinched up and surrounded by a ligature. The ends were cut short, lymph was effused around, the threads cut their way into the bowel, and were discharged. The same practice is applicable to slight incised wounds of the bowel from other accidents. If the part be in a mortified state, the stricture ought, if necessary, to be divided without disturbance of the adhesions; and the free exit of the contents should be provided for. Astonishing recoveries have been made after the loss of considerable portions of small intestine; but the further the breach is from the stomach, of course the greater is the chance of the patient being nourished sufficiently to sustain the cure. The explanation of the process, by which the tract of the intestinal tube is restored, is admirably given by the illustrious Scarpa.* The efforts of nature may be somewhat assisted by judiciously applied pressure. Destruction of the septum by the gradual approximation of the blades of forceps, as practised by Dupuytren, may hasten the cure, though at some hazard to the patient, there being no small risk of thereby exciting inflammatory action in the abdominal cavity. It is now ascertained that cutting for rupture is not followed by a cure of the descent, and that a truss is as essential after as before the operation.

[The division of the septum as practised by M. Dupuytren by means of forceps, offers no advantages over the more simple and equally certain method of cure recommended in such cases by Dr. Physick. A finger being introduced into one orifice of the intestine and the thumb in the other, the surgeon satisfies himself that nothing intervenes between them but the sides of the

bowel. This being the case, a crooked needle, armed with a ligature, is passed from the superior into the inferior portion of the intestine, through the sides, which are in contact. The ends of the ligature are then tied at the external opening with a slip-knot, sufficiently tight to keep the serous surfaces of the intestine included in the loop, in contact. The ends of the ligature are left hanging at the orifice for the purpose of tightening the knot as it may be required. The inflammation induced by this causes a deposite of lymph, and a consequent adhesion of the two sides of the intestine to each other. After this union becomes sufficiently firm, an incision, making a direct communication between the upper and lower portions of the intestine, is to be made, and means made use of to ensure the closure of the external orifice.]

Inguinal hernia is met with in the female in the oblique form, but not very frequently; the openings in the parietes and the canal itself being small, and in just proportion to the ligament passing through them. When recent, the tumour occupies the groin above Poupart's ligament; and as it increases it descends into the labium pudendi, covered by the common integument, and by the same layers as in the male, though not so distinct or so fully developed. A little difficulty has been occasionally experienced, particularly in patients loaded with fat, in distinguishing betwixt this hernia and that which passes under the ligament of Poupart. The crural descent is turned up, so as to overlap the lower part of the abdominal parietes; but it can be depressed to a certain extent towards the thigh, and then the course of the ligament can be traced satisfactorily. In the female, the same treatment in all conditions of the disease is necessary as for the other sex, and the same steps and precautions are to be observed in the operation.

CRURAL HERNIA.

Both sexes are liable to femoral hernia, but the female far more frequently than the male. In the latter it is an exceedingly rare occurrence. It may, therefore, be here considered with propriety as occurring in the female, any peculiarities in treatment being adverted to cursorily in the proper place. The greater size of the space betwixt the femoral vessels and the tuberosity of the pubes, under the ligament of Poupart,—the

crural ring—as it is called,—may account for its more frequent appearance in the female. The tumour presents itself as a small round elastic knob in the hollow of the thigh, on the inside of the femoral vessels; it is seldom larger than a small orange, but occasionally it attains, even in the male, a very great bulk, spreading upon the thigh and over the lower part of the iliac region of the abdomen. The existence of the descent is often concealed through motives of delicacy, and great suffering is endured from time to time, perhaps without the patient being fully aware of the cause; or she may be unwilling to believe that the symptoms arise from the presence of the swelling. The tumour is reducible or irreducible, in part or in whole; very frequently a portion of omentum remains always down, and a knuckle of bowel slips in occasionally on violent exertion. When the existence of crural hernia is made known, means should be taken to retain it; and a truss without a thigh-strap, if possible, should be carefully fitted for the purpose of preventing its recurrence. When part only is reducible, a concave pad may be worn with safety and advantage. The symptoms arising from confinement and swelling of the bowel are the same as already described; but, in this kind of protrusion, their progress and severity are generally more rapid and intense, owing to the smallness of the aperture, the unyielding nature of the tissues composing it, and the sharpness of the edge against which the contents of the sac are pressed. The same, or even greater, necessity exists for prompt interference, when strangulation of the tumour occurs. The taxis should be perseveringly employed, and with proper precautions. The same position of the trunk is observed as in reducing inguinal hernia; but besides that, the thigh should be fully bent and rotated inwards, in order that the crural ring may be more fully relaxed. The pressure should be made with the points of the fingers spread around the tumour, so that it may be uniform, and calculated to diminish its volume; it should be at the same time directed towards the centre of the thigh,—towards the lesser trochanter, as it were,—the object being to depress the body of the hernia, to pull it down from the tendon of the external oblique over which it has turned upon itself, and thus to bring it in a line with its neck.

Should the taxis fail, assisted, if thought proper, by general bleeding or the warm bath, or both, no delay is admissible in having recourse to operation.

The descent takes place through the space betwixt the femoral vein and the crescentic portion of the crural arch; and it emerges on the thigh through the opening in the fascia lata, at its separation into iliac and pubic portions for the entrance of the saphena vein. The peritoneal sac, in passing down through the cribriform fascia, carries a layer of the condensed cellular tissue before it, and this forms its proper sheath. It is strong and dense over the neck and body of the swelling, at the fundus it is weak and often deficient: in fact, one or more of the natural openings in the fascia against which the parts have been pushed, and which has been protruded before the sac, become widened. More superficially, the hernial tumour is covered by what has been called the loose cellular fascia of the groin, a tissue involving the lymphatic glands and some small venous branches. The neck of the sac is immediately invested on the exterior of its fascia propria, by the crural arch—a very strong band of fibres, the formation and relations of which were, I believe, first clearly pointed out by me, in a memoir on the subject, published in 1819. The band is formed by the junction of the external and internal fasciæ of the abdominal muscles with the fascia lata of the thigh. It lies immediately under, parallel to the ligament of Poupart; and is connected with it by condensed cellular tissue. This ligament, together with the lower border of the muscles, can be removed; still leaving entire the fascia superficialis abdominis and fascia transversalis, joined to the iliac portion of the fascia lata of the thigh, and forming a firm resisting arch over the femoral vessels,—attached to the spine of the pubes, and forming a sharp and defined edge. It is this part which causes the stricture; and, when the limb is extended and rotated outwards, this border of the opening is put upon the stretch, in consequence of its connexion with the covering of the muscles of the thigh. On the contrary, it is relaxed in a remarkable manner, when the limb is placed in the opposite position. Thus are explained the directions formerly given for the position of the patient, so as to favour the return of the descent by taxis.

The operation for the femoral hernia consists in dividing the superimposed integument and fatty matter, in order to expose the fascia propria and sac. The incision through the coverings may be made, as recommended by our greatest modern authority on this and other surgical subjects to which he has directed his attention, Sir A. Cooper—thus. I have, for some years, preferred an incision along the line of Poupart's ligament, with another falling from its middle over the body of the tumour, thus for the left, or reversed for the right side. The parts are in this way more fully exposed, and the discharges escape readily at the extremity of the lower incision, the adhesion of the greater part of the wound being at the same time not interfered with. The incisions may be made by cutting from without; or, what is better, as causing less pain, and being more safe should the patient be restless and not easily restrained, the skin having been pinched up betwixt the fingers and thumb of the surgeon and assistant, may be divided by passing the knife through the fold, with its back towards the sac. The cellular covering of the tumour is then raised with the forceps, and divided with care; the fascia, thus exposed, is opened on the prominent part of the swelling; and, in doing so, its thinness or deficiency at the lower part must not be lost sight of. If the surgeon aim in trying to give relief without opening the sac, he may now pass his narrow blunt-pointed bistoury betwixt it and the fascia, upon a director insinuated under a sharp and tight margin of the crural aperture; then turning the edge forwards, slightly towards the mesial line, and raising its handle, he will divide the resisting fibres. He may now try to reduce the contents of the sac by pressure; but, in nine cases out of ten, he will fail; and he is much more likely to succeed in pushing back sac and all—rather a serious accident. This plan was advocated strongly, long ago, by Petit and Monro secundus, and has lately been revived and practised, in a few cases, by my friend Mr. Key, senior surgeon of Guy's, and his colleagues. Some objections have been stated to this practice, as applied to inguinal hernia: they apply with greater force here. It is rarely pos-

sible to effect the object, although there is no harm done by trying it in some cases; but in others, constituting the vast majority, the attempt must prove very unsafe. There is a risk, as noticed above, of returning the sac with its contents, in which case the strangulation would not be relieved, as I know from experience. It is almost always necessary to examine the bowel, to pull it down a little, and empty it of the accumulated matter; thus removing, in some measure, the notches in it caused by pressure on the sharp edge of the ring, the continuation of which often leads to a fatal result, after the return of the parts, however sound they may be otherwise; it is besides sometimes advisable to leave the parts unreduced. In all cases, therefore, in which the strangulation is of some duration, the sac should be exposed by division of its proper covering, and opened; this requires some degree of delicacy and tact. The fascia and sac are to be carefully distinguished. The serous membrane is not often thickened, but accumulation of fatty matter sometimes takes place, to a great extent, on it outer surface, and may materially obscure the appearances of parts. Also, the sac, though thin, may be in close contact with the contents: there may be little or no serosity within it, or it may be glued to them by a layer of lymph. The circumstances are so various, as regards the condition of both the containing and contained parts, that great circumspection is demanded in every operation of this kind. The sac having been opened slightly, by pinching up a little bit and dividing it with the knife laid flat upon the surface of the tumour, is then slit up with the blunt-pointed knife, to its full extent.

In the hospital, I operated on a case, a few weeks ago, in which there was no possibility of pinching up the sac, with either the fingers or forceps; it contained no fluid, and was impacted most firmly with bowel. Very fortunately, however, the membrane was thin; and, observing a pellet of fat underneath, I scratched very cautiously with the point of the knife in the unsupported hand, until a puncture was made sufficient to admit the blunt point of a narrow bistoury. Omentum may be looked and felt for, in such a case, in choosing a part to make the opening; but here there was none. The fore-finger is the

best and safest guide for the bistoury in reaching the stricture. The nail of the left or right, according to the side operated upon is passed within the sac, to the edge of the ring. The pulsation of any vessel immediately behind it will thus be felt; and the circumstance of either the obturator artery, or a large anastomosing branch betwixt that and the epigastric, turning round the opening which embraces the neck of the sac, is not to be lost sight of. The presence of the cord on the fore part of the crural ring in the male, and of the vessels forming the round ligament in the female, need not disconcert the operator; for in no case is it necessary to divide many fibres of the crural arch. The ligament of Poupart, which forms the lower pillar of the external abdominal ring, lies betwixt the stricture and the inguinal canal with its contents; it has nothing to do with the formation of the stricture; and is of course left untouched. The probe-pointed knife is entered, not further than a line; and its edge having been turned forwards and inwards towards the tuberosity of the pubes, the fibres are felt to yield, and the point of the finger passes on. The neck of the sac is very narrow, and the serous membrane composing it is supported and embraced very tightly by condensed cellular tissue presenting a fibrous appearance; if any shred of this be left undivided, the reduction cannot be accomplished. In operating on an old lady, in the neighbourhood of the hospital, one evening in the course of last winter, I had, as I supposed, sufficiently relieved the stricture; and then tried, ineffectually, to pull down and empty the portion of bowel. On passing the finger along it, the cause of the difficulty was discovered to be a single resisting fibre, like a sewing thread, but very strong and indented into the gut. This was forthwith divided. The parts were easily replaced, and the patient made a rapid recovery.

The division of the stricture having been satisfactorily effected, the parts, if sound, are returned. The patient's body and limb of the effected side are placed as in the taxis; and this must not be overlooked, otherwise a great deal of delay may arise in completing an otherwise well-performed operation. The bowel is emptied and replaced with gentleness, and a point or two of suture having been inserted, means are taken

to prevent a further descent. After the operation, the attention of the surgeon must not be relaxed. The patient may probably have instant relief in his bowels; the vomiting may cease, and the tenderness abate; the constitutional disturbance may also disappear. But, in many cases, and from various causes, the cou se of events is by no means so favourable; the obstruction is not relieved, and the symptoms continue. In the first instance, the treatment should consist in exhibiting copious enemata, by means of Read's syringe,—undoubtedly the best, neatest, most simple and efficient instrument of the kind.—This, after some hours, will be followed by calomel, or by other purgatives, and by medicines calculated to allay irritability of the stomach. It is often advisable to apply a number of leeches to the abdominal parietes, in order to avert or relieve inflammatory action. Fatal terminations frequently follow, in consequence either of the general disturbance of the system or of the local mischief. The bowel may give way, and effusion occur into the peritoneal sac; or the part which was down may not resume its functions, having lost its contractibility, and become, in fact, paralyzed; the fæcal matters may not pass onwards, in consequence of permanent narrowing of the gut where it was pressed against the edge of the opening; or inflammatory action may run its course, in spite of all that can be devised to moderate it. Or the patient may have had his powers of life, lowered by previous mismanagement, having been nearly poisoned by tobacco, or other drugs. I have seen the operation undertaken, when the state of collapse was so great that scarcely a drop of blood oozed from the incisions; the patient was not slow in dying.

Umbilical and ventral herniæ, when observed, must be retained by proper apparatus. The openings through which they pass are large, and strangulation is consequently unfrequent. When operative procedure is demanded, and the tumour large, as is usually the case, the incisions should be limited and confined to the side most removed from parts of importance; only a very small opening should be made; the stricture is then relieved, so that the parts may be returned, if this be practicable and advisable; or at all events, the effects of the constriction are re-

moved. The incision, in umbilical hernia, is made on the lower surface of the neck, in the linea alba. No surgical interference can take place in cases of protrusion through the openings in the diaphragm, through the obturator or ischiatic foramina, or in other rare and nternal displacements.

CHAPTER XV.

CONGENITAL DEFICIENCIES AND DEFORMITIES.

It would be a most difficult undertaking, and out of place here, either to enumerate the various congenital deficiencies and monstrosities, or to attempt to account satisfactorily for the imperfect developement of the fœtus in utero; for the extraordinary malformations and transposition of organs; for the additions which are made in the form of marks, tumours, and imperfect organs; or for the junction and blending together of parts of two or more individuals in the same mass. Many of these freaks of nature,—as hare-lip and mother's marks,—are believed by many to be the result of some powerful impression made upon the mind of the female after conception, and are thus accounted for by the vulgar. The same kind of deformity is often met with in several children of the same parents; and perhaps in those of one sex only. I have repeatedly treated several cases of club-foot and of hare-lip in the same family; and two of the sketches which illustrate the following remarks, were taken from a family of four, upon all of whom I operated, for the latter deformity, on the same day, in the Royal Infirmary of Edinburgh. The mother stated that her husband, during her first pregnancy, had brought her home a leveret as a pet. It became very tame and familiar, and her neighbours and gossips used to tell her that her child would have a mouth like the hare. Her first born, a male, was brought into the world with a very bad double fissure of the lips and palate; and others appeared in due time, similarly

deformed, though to a less extent; in fact, every one differed from the other in some respects of the deformity, and the operations were modified accordingly. One perfect child, which did not survive long, had been produced in the interval between the two youngest. Every practitioner must have had the same sort of stories told him in similar cases; but it is probable that many of the incidents were not thought of until after the appearance of the unfortunate animal, and consequently are not at all worthy of credit. Many of these connate malformations can be remedied by the art of surgery, when well understood. The proper mode of proceeding, and the period at which the attempt should be made, in the various instances, will by-and-bye be considered.

Puncturing the cranium, in chronic and congenital hydrocephalus, need not be here noticed very fully. There is no dfficulty in the matter, but a beneficial result cannot be reckoned upon with any degree of confidence. Cases have been published from time to time, in which advantage is said to have resulted from the practice, and very lately some very striking instances have been brought forward by Dr. Conquest; their result would at least warrant a repetition of the proceeding, in favorable cases. Interference with those membranous projections filled with serosity, from between the cranial bones, and which often form large projections of the forehead or occipit, is seldom if ever followed by any good result.

The orifice formed by the eyelids is sometimes too small, being contracted by a membranous slip at either angle. This can readily be divided by passing a bent sharp-pointed bistoury under it. The fissures are occasionally misplaced and drawn towards the temples, a large space appearing betwixt them; the vision is therefore rendered imperfect. The deformity and inconvenience can often be remedied, by the removal of an oval slip of integument from the mesial line, over the glabella; the size of the portion removed must depend on the extent of separation. The edges of the integument are forthwith put together by one or more points of suture; a few narrow slips of plaster are applied some time after, and in twenty-four hours the

threads may be removed. Ptosis,—falling down, or depression of the upper eyelid,—may be the result either of paralysis of the levator muscle, or of looseness and relaxation of the integument. This is either natural, or the result of inflammatory œdema. Benefit occasionally accrues from the removal of a fold of the relaxed integument. This is sometimes effected by the employment of escharotics; but incision of the part is more exact and less painful. A fold having been pinched up and held by the fingers or in a pair of flat-mouthed forceps, with a fine knife an oval portion is excised. The edges are then put together by one or two points of fine interrupted suture. The lid is thus permanently elevated, but in such a way that the patient can expose or shut the lids at pleasure. The heavy look and the imperfection of vision are removed.

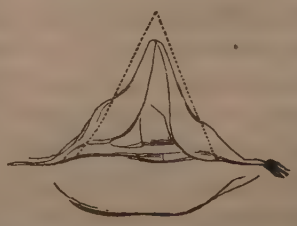
HARE-LIP AND SPLIT PALATE.

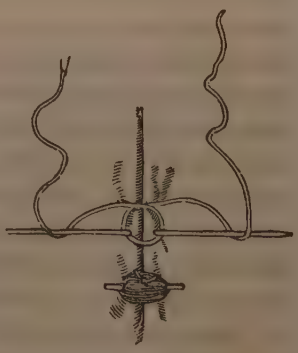
Fissures and deficiencies of the lips, and of the superior maxillary and other bones, are constantly met with in a variety of forms. The simple hare-lip, without any imperfection of the osseous structure, is here shown; and this should be so treated that, upon close examination, only the slightest possible line can be detected; but very generally the operation is imperfectly performed, the edges are not properly pared, and the rounded margins, where the membrane covering the edge of the fissure joins the true prolabium, are not removed to a sufficient extent. A notch is still consequently left at the lower part; and the scar is broad, puckered, and uneven; the teeth are exposed, and the attention is at once painfully attracted to the part, and to the individual so affected. Many patients are scarcely if at all benefited by the attempt, conducted in this slovenly manner; and often, at a later period of life, they are found very anxious to have the unseemly cicatrix taken away by a second operation; not a year passes over without several such cases being presented to me, both in public and in private practice. The extent of fissure is very various

in different individuals; but whatever that may be, it may be pared, and its edges may be laid together smoothly, by adopting a proper method.

The operation may be performed at all ages, but it is generally advisable to delay interfering until the child has attained the age of two and a half or three years; or, at all events, until the greater number of the temporary teeth have come through the gums. In bad cases, some of the teeth, with the alveolar processes, must be removed before uniting the lip; and the child will, at this period, be better able to bear the proceeding. From two to four years is certainly the time to be preferred; but although the operation is often necessarily performed much later on children, and also on adults, yet the parts accommodate themselves well, and the deformity is greatly obviated. A great variety of forceps and scissors have been contrived, for holding and cutting the lip. The fingers best answer the first purpose; and a plain, narrow, sharp-pointed bistoury will serve the other. The surgeon has the child placed on the knee of a nurse, after having been wrapped and pinned up in a large cloth—so that the hands and feet may be perfectly confined, and all struggling prevented. This is also an admirable mode of managing children of maturer growth, if their steadiness cannot be relied upon; they are thus rendered perfectly secure and helpless, so that the proceeding may be completed without interruption, and with much saving of pain and blood. The surgeon, having secured the head betwixt his knees, seizes one corner of the lip with one hand, and enters the point of the knife above the apex of the fissure close to the nostril, or even within it in some cases; and pushing the instrument through the lip, he carries it downwards, so as to pare off the edge completely,—as seen in the diagrams. The opposite side is then laid hold of, and the bistoury, entered again near the first point, is slid along so as to make an incision similar to the first; both must be so planned that they shall be as nearly as possible of equal length. It has been proposed to make them slightly concave, in order that, when united, the lower part might project a little, and thus give the lip a more natural appearance. The position of the surgeon is behind and above the patient, and in operating upon

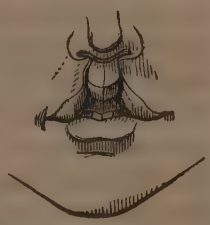
adults he stands behind the patient seated on a low chair; the incision on the left side is made with the right hand, that on the right with the left; or the left hand may be crossed over, although awkwardly, so as to lay hold of either flap, the right hand being used throughout in cutting. After the edges have been thus made raw, the detached slips are to be cut out from the upper angle; they are for this purpose laid hold of by the fingers, or by a pair of dissecting forceps, and the edge of the bistoury is turned against their remaining attachment, so as to make the two incisions unite at a very acute point. I have latterly made this part of the incision first, and then transfixed on each side, thus. The incisions having been completed, the edges must be brought together with neatness and accuracy, so that there shall be no puckering or over-lapping, no rising of one surface over the other, no notch or deficiency at the lower edge, and no space for the accumulation of blood betwixt the cut surfaces. These indications are not fulfilled by any plaster, and very inefficiently by the interrupted suture. The sutura circumvoluta, or twisted suture, is the most effectual. The old-fashioned, clumsy hare-lip pins of silver or gold, with moveable steel points, and the porte-aiguille, for their introduction, are, it is presumed, scarcely ever now employed. I have been long in the habit of using sewing-needles of different sizes, with heads made of sealing-wax to facilitate their application; latterly I have extensively used long rounded needles, made purposely, with sharp spear-points—and these I greatly prefer. They are entered very easily, without a head, in any direction that is desirable. Two needles are generally necessary to bring the parts neatly in contact; one alone will seldom be sufficient, and it is not often that three are re-



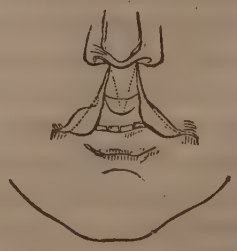


quired. The first should be introduced close to the free margin of the lip, through two-thirds of its thickness; and it ought to be so placed that the prolabium on each side shall be perfectly on a level. The second may then be passed mid-way between the first and the top of the fissure. Thick stay-silk, well waxed, is turned round the pins, and secured as shown in the sketch; their ends are then cut short with nippers. If the threads are crossed from one pin to the other, in order to lay the edges more smoothly, care must be taken not to drag together the two points of suture. No dressing ought on any account to be applied; it may do harm by retaining secretions, and heating the wound; and it can do no good. The pins may generally be removed, with safety and propriety, at the end of forty-eight hours; the threads adhere for some days longer; a strip of isinglass-plaster may then be applied, if thought advisable, from one cheek to the other over the threads.

In double hare-lip, the variation in appearance and extent of deficiency is very great. The fissure may be short, and the interposed slip long and free. The bones may be sound and perfect. Or the spaces are wide; the nostrils are as one cavity to the mouth; the intermediate pieces of the superior maxillæ (ossa incisiva, as they may here properly enough be called) project, and push the portion of lip before them, so as to come in contact with the tip of the nose. This projecting portion is often short, and firmly incorporated with the bone. From the piece of bone, thus awkwardly forming the anterior extremity of the septum narium, the central incisors generally grow out very irregularly. The operation for uniting the double fissure must consequently be varied very much to suit circumstances. In the more simple form, the one side is pared first, as described in treating of the simple fissure; then the other is similarly incised; and by passing needles across the two wounds and through the interposed slip, the parts are at once put together neatly and effectually.



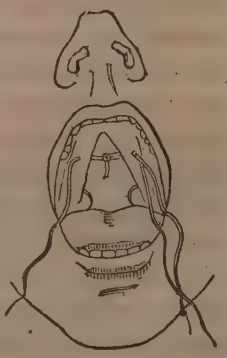
This is always preferable to the plan usually recommended, and I believe very generally followed, of performing two operations, at different periods, with an interval of some weeks or months; first uniting one side to the flap, and when that is consolidated, uniting it to the other. Neither of these methods can be followed unless when the slip is long, and its free margin comes readily on a line with that of the lip, so that the prolabium shall be perfectly straight. When the intermediate portion is short, it can be made available thus: its apex is cut so as to form an acute angle, and the upper pin is passed through it, whilst the lower connects the two sides of the lip. In every case it will be advisable, previously to paring the lip, to remove any teeth that by their malposition might interfere with the union, or by their projection cause deformity. When the bone projects very much, and the soft covering is very short and adherent, it will often be better to take away the former at once; and, for this purpose, the part having been surrounded by an incision, a small pair of cutting-pliers are employed. The case then becomes one of single fissure, though not of the most favorable kind; and, by judicious and careful management, an admirable cure can even here be accomplished.



It is very seldom that adhesion fails at any point, if the parts are accurately opposed and retained. I have met with but three cases of disunion, out of a very great number, operated upon at all ages and under all circumstances. In two, it was the result of a severe blow on the part, within a few days after removal of the sutures. In the other, the separation almost immediately followed the removal of the pins, and the failure of adhesion was attributable to the state of the boy's system. He had just recovered from an attack of scarlatina, of which I, being on a flying visit at the time, was not aware; and at the time of the operation, there were, in the same house, patients labouring under the disease and its sequelæ.

The velum palati is sometimes found entire, whilst the bones are deficient, and *vice versa*. In general, however, the fissure extends through both, causing difficulty in receiving nourishment. Many children are thus imperfectly nourished, and perish in consequence. When the individual grows up, he still finds an effort necessary to prevent food from passing through the nostrils, and his articulation is very indistinct and disagreeable. In the majority of such cases, the patient must content himself with having a plate of metal properly fitted to the space; and this may be constructed with a moveable portion behind, or not, as circumstances seem to demand or permit. Occasionally, however, cases present themselves in which the space is not very wide betwixt the two portions of the velum and uvula, and the deficiency of the hard palate is not considerable. In such, a more radical cure is practicable. At a proper age,—when the patient, having attained years of discretion, is willing to submit to some pain and inconvenience, to afford every facility for the accomplishment of the operation, and to throw no obstacle in the way of the union,—an attempt may be made to close the fissure by adhesion of its margins. But it is only in very favorable instances that this velo-synthesis should be attempted; for if the edges do adhere in part, and are put upon the stretch, the patient is not much benefited, if at all; he is not by any means rewarded for all his pain, anxiety, and self-denial. The muscles of the velum cannot act even so perfectly as before, and the proceedings of the dentist in fitting an artificial palate are rather interfered with than otherwise. When everything is favorable, and the operation is determined on, the plan of procedure must be well considered beforehand, and the apparatus prepared which is calculated to effect the different objects in view. This consists of narrow, sharp-pointed knives for the incisions; long, sharp-pointed forceps, and needles to carry through the ligatures; and instruments to assist in seizing and drawing them tight. The incisions may first be made; or the ligatures may be introduced previously, according to the fancy of the operator. I have generally pared the edges, given the patient plenty of time to clear his throat of blood and recover his composure,—allowing the bleeding to stop, and the irritabi-

lity of the parts to abate,—before interfering farther. The first part of the operation is not attended with much difficulty. The knife, held by the further end of the handle, is introduced through the edge of the fissure at its anterior margin, and carried back to the apex of the one-half of the uvula. This may be laid hold of, and made tense, by means of the forceps already described. The same proceeding is then repeated on the other side, the knife being used by the right and left hand respectively, if the operator can so manage it. The introduction of the ligatures is more easily accomplished in the simple manner here represented, than by the use of any of the forceps, or port-aiguilles, that have been invented. The needles, of different sizes and curves, fixed in handles, somewhat resembling those shown at p. 336, are passed through the velum, from about a quarter of an inch, or more, from its free edge, and towards it. They should penetrate two-thirds of its thickness. This needle carries a double ligature, the noose of which is caught by a blunt hook, and pulled out into the mouth whilst the instrument is withdrawn. A second and smaller ligature is carried through opposite to this; and by means of this second thread, the first and double one is brought through both sides. By a repetition of this proceeding, two, three, or more points of interrupted suture are made. After the edges have been put together by one or two points, no difficulty will be experienced in carrying others through both edges, by means of a more curved instrument in a handle, or by the use of a small needle carried in the points of a pair of strong and well fitted forceps. Before the ligatures are finally secured, and the parts consequently stretched, an incision should be made on each side towards the alveolar ridge, through the anterior surface of the velum. The dotted lines, in the preceding sketch, indicate the position and extent of these incisions. Thus the edges come together more easily, and the strain is taken off the threads, so that there is less risk of these making their way out by ulceration. All



motion of the parts should be guarded against as much as possible. The patient should make no attempt whatever at articulation for many days, and his efforts at deglutition should be as slight and rare as possible. The risk of failure is considerable; the parts are not favorably circumstanced for union; their involuntary movements, and the moisture by which they are bathed on all sides, are greatly opposed to the process; yet by careful adaptation of the parts, and, by the adoption of the precautionary means calculated to relax and keep them quiet, a favorable result may often be anticipated.

IMPERFECTIONS OF THE TRUNK, LIMBS, &c.

Spina bifida is a projection from the mesial line on the posterior aspect of the trunk, generally in the lumbar or sacral region, and formed by dilatation and extrusion of the membranes of the spinal cord, the rings of the vertebræ being deficient to some extent. It may be reduced in bulk by repeated punctures, and gradual evacuation of the contained serosity. The patient may live for a considerable time, the developement of power in the lower limbs depending upon the state of the cord; but a permanent cure can scarcely be expected. The operation of puncture is not attended with difficulty or danger, and may be conveniently performed with a grooved needle.

Surgeons are frequently consulted about deformities of the hands and feet. The parts are occasionally redundant. There is perhaps the rudiment of an additional thumb, finger, or toe. This is not attached by any articulation, and not furnished with tendons. Division of the integument, with a knife or sharp scissors, is all that is required for removal of the deformity. In adults, the attachment is often broad and firm; then proper flaps must be formed, so as to cover the exposed surface. Webs of skin, connecting the fingers, have to be divided when they are of such an extent as to impede motion. This is done at once by entering a bistoury through the fold at its base, and cutting outwards, or by cutting from the edge to a sufficient depth. There is sometimes a good deal of trouble in preventing recurrence of the web, or contraction during the cicatrization. I have thought of making a perforation through the web towards

the proximal extremity of the finger, and by the introduction of some foreign body, as a piece of thick firm cord, preventing its healing: after the edges have cicatrized, then the remainder of the web might be cut at one sweep, and the fingers dressed separately for a sufficient time.

The openings of mucous canals are not unfrequently closed, more or less perfectly; the eyelids, nostrils, ears, are found to be obstructed occasionally, and in such a way that the assistance of our art may prove serviceable. Occlusion of the anus is by no means uncommon, and, when congenital, the surgeon is of course called upon to interfere at a very early period; the possibility of affording relief will depend upon the extent of closure. In some cases, the mere extremity is covered by a membrane not thicker than the common integument, and the impulse of the contents of the bowel can be felt against the finger when the child cries; the operation is then simple, and consists in making an incision with the point of the bistoury and crossing it; there will be no trouble required in keeping it open, no tents or bougies are wanted. In other cases the rectum is imperforate to a considerable extent—is, in fact, entirely deficient; the large intestine may terminate at the top of the sacrum, or somewhere between that and the natural situation of the anus. In those instances, an attempt may be made to reach the cul de sac by careful incisions, guided by the finger, but the narrow space does not admit of any deep exploration: the situation of the bladder, and the vessels of the pelvis, is not to be forgotten; the plunge of a trocar at random is certainly not warrantable, nor is searching for the bowel, as has been proposed, by incision of the abdominal parietes. The imperfection of the bowel, when considerable, is not unfrequently coupled with other malformations and displacements of viscera.

The imperfections and malformations of the genital organs, in both sexes, furnish frequent opportunities for the exercise of the surgeon's skill and dexterity. The urethra in the male organ is very frequently not carried forward to the proper situation of the orifice—of which, however, there is generally a vestige—but terminates somewhere behind the glans, in the situation of the frænum preputii; half an inch or more may be wanting to

complete the passage. In consequence, the functions of the part cannot all be properly fulfilled; very often the whole urethra and bladder are rendered irritable, and drawn into diseased action; alteration of structure follows as a necessary consequence; this may be attributable to the narrow condition of the orifice, or to the exposure of part of the mucous membrane to friction, and various irritations. The prepuce is generally deficient in these cases, or so short that it does not protect the glans. This hypospadias, as it is denominated, can occasionally be remedied. Attempts have been made by perforating the glans in the course of the natural canal, and by the insertion of a tube in the perforation, to carry forward the current and elongate the urethra permanently; this method does not answer; there is a want of substance in the part, and sloughing is generally the consequence of the attempt. I have sometimes succeeded, and in cases where other means have been tried unsuccessfully, in protecting the exposed and irritable lining membrane of the passage, and continuing the canal open to the apex of the organ, by turning back a portion of the prepuce and uniting it without any twist, the lining membrane presenting outwards; patients have been thus relieved from the frequent calls to make water, the nocturnal emissions, and other unpleasant consequences.

The deficiency termed epispadias is very rarely met with; the subjoined sketch represents a very complete instance of it; nearly four inches of the urethra were exposed; the mucous membrane was not much changed, excepting perhaps in colour, which was paler than natural, and its lacunæ were beautifully perfect. The man was about twenty-three years of age when he applied for relief; he wished at first to make it appear that the affection was the result of injury; but after submitting to an operation, which was most perfectly successful, he acknowledged that it was a connate deficiency, and attributed it to some impression made upon his mother's imagination when pregnant. The operation consisted in paring the edges thoroughly, and putting them together over a catheter, by the introduction of

many points of twisted suture. I saw the patient some years after the operation, and touched for him, with a heated needle, a very minute fistulous opening near the pubes, through which not more than a drop of urine oozed during micturition: this had the desired effect of closing the aperture; and the organ was then, as he stated, in all respects, and for all purposes, as perfect as he could desire. The prepuce, when deficient or short, may be supplied or elongated, as recommended by Celsus, by circular incision of the skin of the penis near the pubes, combined with sufficiently tight ligature round the orifice of the prepuce; but, as he has stated, the difficulties of attaining the object must be considerable, when the organ is of large size and the covering scanty. This operation, therefore, need not be undertaken, unless at the urgent request of the patient.

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